Addressing the Gaps in Eighth-Grade Students' Information Literacy Skills: A Mixed Methods Approach

by
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Abstract

Information literacy considers how individuals find, evaluate, and use information. This quasi-experimental, fixed-effects, mixed-methods study explored strategies for addressing the gaps in eighth-grade students' information literacy skills at an all-girls independent school. To teach the specific information literacy skill of evaluating online information sources, students participated in a discipline-based, gamified instructional unit with teacher-librarian collaboration. All eighth-grade students participated in a seven-day instructional unit during social studies classes, with 50-minute class periods. Students completed lessons in Checkology, a web-based platform with gamified, interactive lessons. At the end of each class, the students participated in a whole-group discussion. Next, students worked on an individual research project. In addition to librarian-curated resources, students were asked to independently choose at least one online information source. Students also completed the ninth-grade, 10-item Evaluate Sources and Information subsection of the Tool for Real-time Assessment of Information Literacy Skills before and after the intervention. Additional data included attendance sheets, classroom activities time logs, field notes from classroom observations, transcripts from student focus groups, student source annotations, and Checkology class reports.

Findings indicated successful adherence to the research design. However, the dose delivered included additional activities, as students completed the planned lessons in less time than expected. Overall, students reported a positive experience interacting with the intervention components. Student results from the preintervention and postintervention assessment indicated a significant difference between the intervention

and the students' ability to evaluate online information sources. Qualitative data from focus groups and observations also revealed a positive change in students' ability to evaluate online information sources. The intervention factors that appeared to provide the most impact included the discipline-based approach and teacher-librarian collaboration, while the impact of gamification on student learning was less clear. Data on self-efficacy was limited, but suggested a positive change in students.
Keywords: discipline-based approach, evaluating information sources, gamification, information literacy, middle school, teacher-librarian collaboration

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Table of Contents

List of Tables

List of Figures

Executive Summary

Digital technologies such as mobile devices and online content have transformed the ways in which we live and work (Collins & Halverson, 2010; Geer & Sweeney, 2012; Geyer, 2009; Mehta, 2013). Even as we experience a digital age, schools are slow to transform the way we learn (Tyack & Cuban, 1995). To better prepare students for participation as global citizens, schools should shift from traditional educational practices—standardized testing, teachers as the expert, and uniform learning experiences—to an emphasis on digital age learning to meet the needs of modern students (Collins & Halverson, 2010). To fully participate and thrive in the digital age, where technology ensures ubiquitous access to information, individuals must learn new technology-related skills (Gross & Latham, 2007; Hobbs, 2010; Pittman & Gaines, 2015; U.S. Department of Education, 2016). These skills include information literacy (IL) and media literacy (ML), both critical components within the overarching theme of digital age skills. IL includes the ability to identify, access, evaluate, and use information "effectively, efficiently, and ethically" (Julien & Barker, 2009, p. 12; Partnership for 21st Century Learning, 2015). ML, on the other hand, includes the ability to locate information—like IL—but also the ability to analyze media messages, create multimedia content, behave responsibly, and take social action within a community (Hobbs, 2010; Partnership for 21st Century Learning, 2015).

Problem of Practice

New forms of media "have fragmented, connected, converged, diversified, homogenized, flattened, broadened, and reshaped the world" (Kellner & Share, 2007, p. 59). Furthermore, the proliferation of the Internet has shifted the "when and how"

(Metzger, 2007, p. 2089) of finding and using information. This new digital landscape makes it difficult for students to locate, understand, evaluate, and use information online (Collins & Halverson, 2010; Grafstein, 2002). Additionally, students often struggle to successfully navigate media and web-based content (Bowler, 2010; Chung & Neuman, 2007; Julien & Barker, 2009; Metzger, Flanagin, Markov, Grossman, & Bulger, 2015; Probert, 2009; Stanford History Education Group, 2016). For example, a study of high school students in Canada found that "adolescents, far from being technological wizards and information gurus, actually have weak information-seeking skills" (Bowler, 2010, p. 29). Another study found that 80% of middle school students could not differentiate between an advertisement, fake news, and credible information online (Stanford History Education Group, 2016). Thus, gaps exist in middle and high school students' IL and ML skills within the classroom learning environment.

Professional Context

The school in the study is an all-girls independent school with students in fifth through twelfth grade. The school has a history of over 150 years of single-gender education. It is located in a wealthy suburban neighborhood in the southeastern United States. Students matriculate from both private and public schools in several surrounding counties. In the 2016-17 school year, the school enrolled 686 students in fifth through twelfth grade, with 14% students of color and 16% of students receiving partial need-based financial aid.

The school has a wealth of resources related to information technology including a 1:1 student-to-device ratio, campus-wide wireless access, Google Apps for Education, Microsoft Office, subscriptions to numerous electronic databases, and a variety of educational software and technology tools. Regarding IL and ML instruction, the school employs an academic technology specialist and several librarians who collaborate with classroom teachers to provide integrated instruction.

Needs Assessment

The purpose of the mixed-methods needs assessment conducted during the spring of 2017 was to identify potential gaps in students' IL and ML skills within the professional context. The needs assessment included several constructs: students' NML skills, students' IL and ML skills in the classroom, students' IL skills self-efficacy, and teacher beliefs about ML in education. Both eighth-grade students ($N = 17$, 19.5% of the total population) and teachers of core academic courses ($N = 9$, 69%) provided data for analysis. Teachers indicated a need for ML instruction within the curriculum at all grade levels, but cited a lack of teacher training and time as primary barriers. Students self-reported strong visualization skills, weak networking skills, and a lack of interest in self-publishing content online. Students also self-reported high self-efficacy toward IL except for the skill of creating bibliographic records. However, classroom observations indicated a disconnect between students' beliefs and their actual skills, as students struggled with early stages of research including choosing a topic, generating keywords, and locating sources of information.

Conceptual and Theoretical Frameworks

Both cognitivism and constructivism served as theoretical frameworks for understanding the information search process. Cognitivism views learning as a combination of behavior, cognition, and the learning environment (Bandura, 1986). Cognitivism helps to understand how and why individuals process information, including the strategies of metacognition and self-efficacy. Metacognition is the act of thinking about the thinking process (Bransford, Brown, & Cocking, 2000). When conducting an information search, individuals employ metacognition to find and evaluate information. Self-efficacy includes an individual's "expectations of personal mastery" (Bandura, 1977, p. 193) related to specific tasks and can come from emotion, performance, verbal cues, and vicarious experiences. Improving students' self-efficacy has the potential to improve student performance outcomes (Ketelhut, 2007), thus creating a positive impact on the student learning experience. Constructivism views learning as a personal interaction between individual learners and their environment (Ertmer & Newby, 1993; von Glasersfeld, 2005). New knowledge builds upon prior experience and existing knowledge, making learning a contextual experience (Ernest, 2010). Regarding IL, individuals often apply their skills within the context of the research process to explore an identified problem (Hobbs, 2010). The information search process (ISP) model (Kuhlthau, 1990) served as a conceptual framework for understanding. It includes six stages: initiation, selection, exploration, formulation, collection, and presentation.

Strategies for Intervention

Existing research suggests that IL instruction should incorporate multiple strategies to address student needs (Attali & Arieli-Attali, 2015; Broussard & Oberlin, 2011). While IL instruction can occur in a variety of formats, librarians serve a critical role in IL instruction as research experts (Anderson & May, 2010; Becker, 2013; Ford, Izumi, Lottes, & Richardson, 2015; Greer, Hess, & Kraemer, 2016). Existing research also suggests that students and teachers prefer a discipline-based approach to IL instruction rather than a stand-alone course, as it provides clear connections to existing content (Dotson & Diaz, 2008; Jackson, 2007). Additionally, gamification can be integrated to increase student engagement and learning outcomes (Becker, 2013; Ford et al., 2015; Laubersheimer, Ryan, & Champaign, 2015; Walsh, 2014). For this study, IL skills instruction was integrated with the existing eighth-grade social studies curriculum. The middle school academic librarian also worked closely with the researcher and social studies teachers throughout the intervention. Additionally, the intervention included a gamified element through use of Checkology (https://checkology.org), an interactive, web-based platform that awards participants badges and points for completing activities.

Research Purpose and Objectives

The purpose of the study was to investigate how a discipline-based, gamified approach to IL skills instruction, with teacher-librarian collaboration, might impact students' ability and self-efficacy toward evaluating online information sources. The study objective was to address gaps in students' IL skills. This research study included both process and outcome evaluation research questions:

Process Evaluation Research Questions (RQ):

RQ1: To what extent did the implementation of the instructional unit align with the intended research design?

RQ2: What were the level and quality of student participant responsiveness during the intervention?

RQ3: What was the overall experience of study participants with the components of the instructional unit, including Checkology, class discussions, and reflection paper?

Outcome Evaluation Research Questions (RQ):

RQ4: What is the change in eighth-grade students' ability to evaluate online information sources based on participation in discipline-based IL instruction and a gamified virtual platform?

RQ5: What is the change in eighth-grade students' self-efficacy toward their own IL skills based on participation in the intervention program?

Research Design

This quasi-experimental study used a convergent, fixed-effects, mixed-methods design (Creswell & Plano Clark, 2011; Henry, 2010). The intervention was an instructional unit that occurred in existing social studies classes. A convergent design allowed for independent data collection that converged during data analysis (Creswell & Plano Clark, 2011). As the researcher was unable to place students into control and treatment groups, a fixed-effects design was used to compare the same individuals at different instances. Quantitative data included attendance sheets, classroom activities time logs, Checkology student reports, and students' pre- and postintervention results from the 10-item Evaluate Sources and Information subsection of the Tool for Real-time Assessment of Information Literacy Skills (TRAILS; Kent State University Libraries, 2017). Qualitative data included field notes from classroom observations, transcripts from student focus groups, and student source annotations. The combination of quantitative and qualitative data provided rich sources of information for exploring how the intervention impacted students.

Intervention

Eighth-grade students ($N = 24$), eighth-grade social studies teachers ($N = 2$), and the middle school librarian participated in an instructional unit that lasted for seven, 50-minute class periods. The instructional unit included four classes of individual student participation within Checkology and during whole-class discussions. Checkology lessons included the following topics: Arguments and Evidence (News Literacy Project, 2019a), Practicing Quality Journalism (News Literacy Project, 2019c), Understanding Bias (News Literacy Project, 2019d), and Misinformation (News Literacy Project, 2019b). It also included three classes of independent student research in the library. Students researched an individual that either challenged or maintained the status quo during a particular time period in American history. Before and after the intervention, students completed the 10-item Evaluate Sources and Information subsection of the TRAILS (Kent State University Libraries, 2017). Also following the intervention, one student from each class section was randomly chosen to participate in a student focus group.

Data Collection and Analysis

Quantitative data included: attendance sheets, classroom activities time logs, Checkology student reports, and pre- and postintervention TRAILS results. Quantitative data analysis included descriptive statistics and a paired t-test for pre- and postintervention TRAILS results. The researcher took field notes during classroom observations, gathered student source annotations, and created transcripts of audio recordings from the student focus groups. Inductive thematic coding was used to analyze field notes and transcripts (Saldaña, 2016). The researcher also examined students' annotations for evidence of skill development. Finally, using deductive reasoning, results from qualitative data analysis were merged with results from quantitative data analysis, where appropriate, to present a comprehensive analysis of the intervention.

Findings

Successful adherence to the planned intervention occurred, with each class averaging 46 minutes in length, or 93% of the planned instructional time. During the intervention, students stayed on-task and there were only a few absences. In Checkology, students earned 90% of possible points, had a 78% lesson completion rate, and earned 70% of possible badges. The majority of students participated during class discussions (67%) and almost all students completed source annotations (92%) during research.

Students expressed mixed reactions to details within individual Checkology lessons, but the overall student experience was positive. Students vocalized excitement during the instructional unit and afterwards, focus group participants provided positive remarks. Furthermore, students in the focus group remarked that Checkology helped them to be more aware of bias, both in sources during research and also in their personal lives. The main feature that students liked about Checkology was its interactivity. The few student criticisms included confusing instructions within certain lesson activities, unrelatable examples, and hesitation to answer personal questions online.

A paired-samples t-test conducted with the total scores from the TRAILS indicated a significant difference between the intervention and the students' ability to evaluate online information sources. This suggests that the intervention had a positive impact on student skills. Classroom observations and focus groups also indicated a positive impact on students' ability to evaluate information sources, particularly for bias. Though students did choose reliable sources, their source annotations were mostly content-focused. In the focus groups, several students acknowledged their improved skills, indicating a positive impact on students' self-efficacy. A few students also remarked that they already had positive self-efficacy of their evaluation skills before the instructional unit, but that the lessons helped them to improve on their skills even further.

Recommendations

Additional research should be conducted related to IL instruction that explores different contexts, populations, intervention components, and research design elements. This research study suggests that a discipline-based, gamified, teacher-librarian collaboration approach to teaching IL skills can positively impact students' self-efficacy and ability to evaluate online information sources. The discipline-based approach allows students to make connections to the existing curriculum. Gamification though badges and points, or through interactive elements (e.g., video-activity format), may act as a motivating factor for some students. Teacher-librarian collaboration provides students with additional guidance and support during the research process, including development of IL skills. Thus, schools looking to provide IL skills instruction within the classroom learning environment should consider adopting a discipline-based, gamified approach and fostering teacher-librarian collaboration.

Chapter 1 – Introduction to the Problem of Practice

Digital technologies such as mobile devices and online content have shifted how people live, work, and learn (Collins & Halverson, 2010; Geer & Sweeney, 2012; Geyer, 2009). Technology can "promote education, democratic self-expression, and social progress" (Kellner & Share, 2005, p. 373). Though digital technology has transformed the way we live and work in the modern world (Mehta, 2013), it has been slow to transform the way we learn (Tyack & Cuban, 1995). To better prepare students for future participation in a global society, schools are challenged to shift from traditional educational practices—standardized testing, teachers as the expert, and uniform learning experiences—to an emphasis on digital age learning to meet the needs of modern students (Collins & Halverson, 2010). However, rather than embrace the tools of the digital age, schools continue to value information as a scarce commodity and view teaching as an isolated content delivery system (Jolls & Wilson, 2014). A strict adherence to tradition means that schools often struggle to connect classroom learning with students' wants and needs (Geer & Sweeney, 2012). With increasing frequency, students fail to see a connection between the school learning environment and what life is like outside of school (Collins & Halverson, 2010). Yet to participate and thrive in the digital age, where technology ensures ubiquitous access to information, individuals must learn new technology-related skills (Gross & Latham, 2007; Hobbs, 2010; Pittman & Gaines, 2015; U.S. Department of Education, 2016). For example, in a knowledge-based economy, full participation in society means that individuals must learn how to effectively find and use information (Collins & Halverson, 2010; Hobbs 2010; Julien & Barker, 2009; Pinto, Cordon, & Diaz, 2010). Therefore, to successfully prepare students for the future, schools should shift their focus to incorporate information literacy (IL) and media literacy (ML) skills instruction (Collins & Halverson, 2010; Hobbs, 2010).

A variety of communication options now exist, including both print and digital media (Collins & Halverson, 2010). The concept of digital literacy conveys the skills necessary for participation in a technology-rich, information-based society (Hobbs, 2010). The current digital age emphasizes global connectedness and information sharing (Trilling & Fadel, 2009). As defined by Hobbs (2010), the five essential competencies of communication and problem-solving in the digital age include the ability to act, access, analyze, evaluate, create, and reflect. Different literacies, including IL and ML, address this shift in modern societal needs (Hobbs, 2010; Koltay, 2011).

Though related, information and media literacies originate from different backgrounds and examine the problem from different perspectives. IL includes the ability to identify, access, evaluate, and use information "effectively, efficiently, and ethically" (Julien & Barker, 2009, p. 12; Partnership for 21st Century Learning, 2015). Hobbs (2010) states that IL focuses on literacy skills during the research process while ML focuses on the critical analysis of messages in multimedia. ML covers information in whatever forms arise—print or digital (Voogt, Erstad, Dede, & Mishra, 2013), while IL skills encompass information embedded within a specific content area (Limberg, Alexandersson, Lantz-Andersson, & Folkesson, 2008). Likewise, Grafstein (2002) sees IL as a form of critical thinking and reasoning that relates to all subject areas because IL requires "being literate *about something*" (p. 202). Furthermore, IL is a complex social practice shaped by the broader social context (Limberg et al., 2008).

ML, on the other hand, includes the ability to locate information—similar to IL—but also includes the ability to analyze media messages, create multimedia content, behave responsibly, and take social action within a community (Hobbs, 2010; Partnership for 21st Century Learning, 2015). ML involves a deep understanding of media use, function, and messages (Potter, 2004). Another definition considers ML a way to "use media intelligently, to discriminate and evaluate media content, to critically dissect media forms, to investigate media effects and uses, and to construct alternative media" (Kellner & Share, 2005, p. 372). The Center for Media Literacy (2003) established five core concepts of ML: all media is constructed; media uses a creative and unique language; individuals interpret the same media differently; media contains embedded values; and most media is constructed to gain power or profit. Additionally, the construction process of media keeps certain content in and other content out; an important distinction for students to consider as media consumers and creators (Kellner & Share, 2005).

While IL and ML are defined in different ways, both literacies serve as critical components within the overarching theme of digital age skills. Both IL and ML consider the skills necessary to be literate as a global, connected citizen. The Partnership for 21st Century Learning (P21) framework includes themes of information communication technology (ICT), IL, and ML as desired student learning outcomes. The P21 framework states that "effective citizens and workers of the 21st century must be able to exhibit a range of functional and critical thinking skills related to information, media, and technology" (Partnership for 21st Century Learning, 2015, p. 5). The International Society for Technology in Education (ISTE) recently updated the ISTE Standards for Students (ISTE, 2016) to focus on transformative learning that uses technology for both knowledge construction and creative communication. The language in both the ISTE Standards for Students and the P21 framework for learning indicate that IL and ML act as components within a broader concept of digital age learning. As overlap exists between IL and ML, the initial dissertation research considered both definitions.

Problem of Practice

A critical component of digital age learning includes developing IL and ML skills (Collins & Halverson, 2010; Hobbs, 2010; Kellner & Share, 2007). New forms of media "have fragmented, connected, converged, diversified, homogenized, flattened, broadened, and reshaped the world" (Kellner & Share, 2007, p. 59). The proliferation of the Internet has shifted the "when and how" (Metzger, 2007, p. 2089) of finding and using information online. In this new landscape, students have a difficult time locating, understanding, evaluating, and using the vast, fluid amount of information available online (Collins & Halverson, 2010; Grafstein, 2002). Furthermore, students often lack the necessary skills for successful navigation of media and web-based content (Bowler, 2010; Chung & Neuman, 2007; Julien & Barker, 2009; Metzger et al., 2015; Probert, 2009; Stanford History Education Group, 2016). A study of high school students in Canada found that "adolescents, far from being technological wizards and information gurus, actually have weak information-seeking skills" (Bowler, 2010, p. 29). Another study found that 80% of middle school students could not differentiate between an advertisement, fake news, and credible information online (Stanford History Education Group, 2016). Thus, a problem of practice (POP) exists in the gaps of middle school students' IL and ML skills within the classroom learning environment. The POP will be explored within the professional context of an all-girls private school in the southeastern United States.

Theoretical Framework: Ecological Systems Theory

Examining a research problem using a theoretical framework ensures a clear and thorough exploration of all aspects of the problem (O'Leary, 2014). Bronfenbrenner's ecological systems theory (EST) provides a framework to further examine the IL and ML skills of students. EST explores the effects of social interactions on human development in a systematic way (Bronfenbrenner, 1979). Therefore, because the POP focuses on student learning within the classroom learning environment, EST acts as an appropriate framework to further examine contributing factors to the POP.

Introduced in the 1970s, Bronfenbrenner developed an ecological model examining human development in the natural environment. Bronfenbrenner's model differed from traditional practices of the time in which developmental psychologists conducted human research primarily in a laboratory or other contrived settings (Bronfenbrenner, 1994). Instead, the ecological model conducts research within a specific context, indicating a more authentic setting. Two propositions define the ecological model. First, Bronfenbrenner (1994) uses the term "proximal processes" to describe human development as complex processes of interaction between the individual and their environment that occur over time. With the POP, the student acts as the individual and the classroom acts as the environment. Second, Bronfenbrenner states that systematic variance in individuals and their environment occurs during the development process. Of course, the POP does not consider one individual student but rather an entire class of students within a school, thus variance exists. Additionally, the model considers the properties of process, person, context, and time as defining characteristics. Research design uses the process-person-context model which includes an examination of defining characters and both propositions concurrently (Bronfenbrenner, 1994). The EST research design method will help the researcher examine IL and ML skills (the process), students (the person), and classroom learning (the context) when considering the problem and designing an intervention.

A main component of EST centers on the development of the individual—the student. To organize this perspective, Bronfenbrenner (1994) uses an analogy of Russian nesting dolls to describe the ecological environment. The levels, from broad to narrow, include the following systems: chronosystems, macrosystems, exosystems, mesosystems, and microsystems. Chronosystems consider how the development of a person and the settings in which they interact evolve over time (Bronfenbrenner, 1994). As students interact with their environment over time, they develop as individuals and as learners. Macrosystems examine broader cultural influences and societal-level forces (Bronfenbrenner, 1994). National societal trends in education affect what schools focus on, affecting whether schools include IL and ML as a priority within the curriculum. Exosystems look at settings that indirectly affect the individual, but with which the individual does not directly interact (Bronfenbrenner, 1994). An exosystem related to the POP includes school leadership of administrators and the board of directors. Mesosystems show the interaction between microsystems, which include the individual and their immediate environment (Bronfenbrenner, 1994). Finally, microsystems include the focal individual. Though students may interact within multiple microsystems such as family and school, the POP focuses only on the school environment. The POP does not address any mesosystemic interactions because it is focused only on the student within the classroom learning environment. Though the original EST included the nesting model as a key component, Neal and Neal (2013) built on Bronfenbrenner's work to develop a networked model of EST. The networked model best describes the POP because schools contain complex systems that impact student learning in many ways. Furthermore, the POP looks at how students learn from information and media, adding additional layers of interactions through digital tools and online resources.

A key difference between a nested and networked model of ecological systems theory is that the nested model focuses on the setting, while the networked model focuses on social interactions (Neal & Neal, 2013). Rather than a series of concentric circles, the networked model contains multiple overlapping circles that all directly or indirectly affect the individual as a focal point. The overlapping systems incorporate different perspectives and allow for a more thorough examination of social interaction and relationships (Neal & Neal, 2013). Moreover, the networked model establishes an operational concept of EST, moving beyond theoretical implications and into research.

In considering both the nested and networked model of EST, the networked model seems most appropriate for understanding the underlying factors that impact IL and ML skills in students (see Figure 1.1). In a school setting, social interaction does not occur in isolation—administrators, families, students, and teachers all interact within the school and surrounding social systems. Additionally, these systems do not occur as subsets, rather they relate to each other as distinct settings and systems that influence and interact with each other and with the individual (Neal & Neal, 2013).

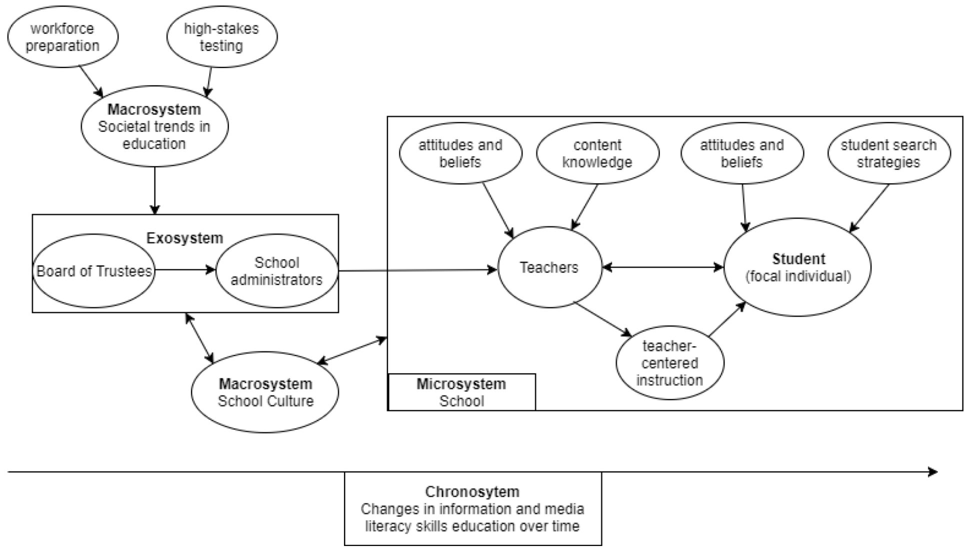


Figure 1.1 Concept map of contributing factors to students' IL and ML skills.

The EST networked model of Neal and Neal (2013) considers the interaction of the focal individual within the microsystem as it occurs within the broader, connected systems. The POP follows the networked model as it considers the student as a focal point of interactions within the school microsystem. The following literature review explores the POP and possible underlying factors.

Various systems interact in different ways and illustrate factors that contribute to the problem. The chronosystem considers the changes in IL and ML education over time. Several macrosystems also relate to the problem. The first macrosystem examines broad societal trends in education, with a focus on workforce preparation as well as the role of high-stakes testing and its impact on the inclusion of IL and ML in the curriculum. The next macrosystem examines school cultural practices and how those influence IL and ML. The exosystem focuses on school-level concerns involving administrators, including school finance and policy decisions. The school microsystem contains students as the focal individual but also includes teachers. Teachers' attitudes, beliefs, and content knowledge impact classroom practices through direct interaction with students in the classroom. Students, who serve as the focal point for the POP, contribute the factors of attitudes, beliefs, lack of voice through teacher-centered instruction, and search strategies. The next section explores each of these systems in greater detail.

Contributing Factors to Gaps in Information and Media Literacy Skills

Schools operate as complex systems, necessitating a deep exploration of contributing factors to a problem within the school (Bryk, Gomez, Grunow, & LeMahieu, 2015). Synthesizing the existing literature provided a deeper understanding of contributing factors to the POP (O'Leary, 2014). The following synthesis of existing research literature uses the networked model of EST to frame the factors of the POP from broad to narrow. The literature review addresses the chronosystem relative to changes in IL and ML education, macrosystems of societal trends in education and school culture, the exosystem of school leadership, the school microsystem, and both teacher and student factors related to IL and ML education within the school microsystem.

Chronosystem: Changes in Information and Media Literacy Education

Chronosystems reflect changes in systems over time (Neal & Neal, 2013). Regarding the POP, the chronosystem reflects changes in the fields of IL and ML education. Examining the chronosystem allows for increased background knowledge, providing context to the problem. Furthermore, the chronosystem examines how changes in IL and ML education affect the student as the focal individual.

Information literacy. While the term IL first appeared in the workplace in the 1970s, the first model of IL education in the United States originated with the publication of Stripling's *Brainstorms and Blueprints* (Loertscher, 2008). A few years later, Eisenberg and Berkowitz created the Big Six Skills Approach which lists the following skills as part of the information problem-solving process: task definition, information seeking strategies, location and access, use, synthesis, and evaluation of information (Big6, n.d.). Educational interest in IL has increased since the late 1980s, particularly with the emergence of web-based practices (Pinto et al., 2010). However, even with increased accessibility and the development of more advanced tools, the current educational model still focuses on a print-dominant literacy model of instruction (Loertscher, 2008), but these models ignore the varied ways that people "receive, process, and create images and information" (Kellner & Share, 2007, p. 59). In the digital age, text has expanded from print-only materials to also include online sources via the Internet (Considine, Horton, & Moorman, 2009; Rowlands et al., 2008). Widespread Internet access means that anyone can publish information, making it more difficult to distinguish credible information online (Rowlands et al., 2008). Traditional literacy instruction only considers text in print form and thus ignores the plethora of information and media sources now available, making traditional literacy instructional methods insufficient for learning in the digital age (Kellner & Share, 2007).

Media literacy. In the 1980s, professor Len Masterman created a foundation for systematic ML education in elementary and secondary schools through the publication of several books on teaching with media (Jolls & Wilson, 2014). His work defined ML education as interpreting the representations of media, or focusing on media as "symbolic sign systems that must be decoded" (Jolls & Wilson, 2014, p. 69). Identifying media as representational indicates a need for a critical analysis component of ML education that extends beyond surface level consumption and production. During the same time period, UNESCO called for the establishment of formal ML education in 1984 during an educational conference in Germany (Bordac, 2014). The call led to the creation of the Partnership for Media Education in 1997 and the current National Association of Media Literacy Education, an organization that promotes ML education in the United States (Bordac, 2014). After the establishment of professional organizations, media education focused on providing hardware and Internet access to schools (Daunic, 2011).

Though there is now increased media access in schools, the current educational context focuses on content-driven instruction and lacks critical analysis (Jolls & Wilson, 2014). ML education needs to shift its focus to help students develop the ability to analyze, evaluate, and communicate using a variety of sources (Daunic, 2011). Though adolescents spend more and more time online consuming different forms of media, they do not always have an opportunity to use media for learning (Koltay, 2011). ML can empower young people to use digital media not just as consumers but as a tool to connect, create, and learn (Hobbs, 2011). However, as discussed in the next section, national educational policies drive the content and context of learning in schools.

Macrosystem: Societal Trends in Education

Macrosystems include broad social forces that influence the definition and structure of settings (Neal & Neal, 2013). National and state educational trends focus on enacting lasting societal progress (Tyack & Cuban, 1995). Within the macrosystem level, contributing factors to the POP include changes in how society views the role of education in workforce preparation and the relationship between curriculum policy and high-stakes testing.

Workforce preparation. Employers typically have high expectations for new employees. One area of high expectations in the digital age includes IL, as employers expect new hires to possess skills for finding and using online information (Head, Van Hoeck, Eschler, & Fullerton, 2013). However, a competency gap occurs because new graduates lack the knowledge and skills that employers desire (Head et al., 2013; Reedy, Mallett, & Soma, 2013). In individual telephone interviews with employers from a variety of industries ($N = 23$) that hired, trained, or supervised recent college graduates, participants reported the inability of new graduates to utilize communication tools, in addition to the web, to find useful information (Head et al., 2013). Furthermore, employers stated that new graduates attempted to find a correct answer quickly rather than engaging in iterative searches for more in-depth results. Before entering the workforce, students need experience beyond high-stakes testing to be competitive and productive within a global market (Limberg et al., 2008).

High-stakes testing. While advocates of high-stakes testing claim numerous educational benefits from the assessment process, high-stakes testing also creates challenges within the educational system at multiple levels (Madaus & Russell, 2010). A relationship exists between high-stakes testing and control of curriculum across grade levels and subject areas, including control of content, form, and pedagogy (Au, 2007; Madaus & Russell, 2010). Because high-stakes testing includes a limited number of subjects, to prepare for assessments teachers exclude non-tested subjects, such as the humanities or media education, and focus only on tested subjects (Au, 2007). This exclusion occurs because, as a response to high-stakes testing, teachers focus solely on test content and preparation in isolation of other content (Madaus & Russell, 2010; Schilder, Lockee, & Saxon, 2016). Harper Valley School is a private institution and thus not subject to mandated state standardized testing. However, it is a college preparatory school, meaning that high-stakes testing still occurs in the form of college entrance exams (e.g., ACT, SAT) and exams for Advanced Placement courses.

While a few IL assessments exist at the secondary school level (e.g., Kent State University Libraries, 2017), assessment of IL is optional and thus often does not occur. Unfortunately, many countries, including the United States, do not currently assess ML skills either, indicating that ML does not receive priority in the classroom (Schilder et al., 2016). However, creating a national ML assessment tool would be challenging due to numerous factors including the difficulty of assessing critical thinking, the subjective nature of ML, expense and time in developing assessments, and the lack of control at the school and classroom level (Schilder et al., 2016). In addition to assessment and the pressures from high-stakes testing, school culture can also influence teaching and learning within the classroom.

Macrosystem: School Culture

The challenge of incorporating ML into the school culture is that it conflicts with traditional school structures (Rantala, 2009). A survey of 1,540 primary school teachers in Turkey found school culture to be critical in facilitating successful ICT integration (Tezci, 2011). ICT considers all forms of information and communication technologies, including online media and web-based content, and thus encompasses digital literacies. These findings suggest that administrator and teacher support are needed for change in school culture to occur. If teachers do not accept a change in school culture, they will not support its policies in the classroom, making true change difficult. However, when teachers receive or even perceive administrator support, a positive relationship occurs that facilitates school culture development, including the potential for increased IL and ML skills (Tezci, 2011).

New forms of ICT, including information and media tools, create a connection between otherwise separate forms of knowledge and literacy, shifting the relationship between traditional educational settings, home life, and the broader community (Livingstone, 2012). For example, traditional school culture promotes teacher-centered instruction, which conflicts with the interactive and interpretive nature of ML and student use. Students find media integral to their lives, yet schools do not capitalize on ICT or media tools as a meaningful learning experience, thus widening the gap between schools and students (Rantala, 2009). While outdated school culture can be a challenge to IL and ML skills instruction, school leadership has the potential to influence teaching and learning at the school level through decision making and setting priorities.

Exosystem: School Leadership

Exosystems influence microsystems through decision making, but exosystem participants may or may not interact with the focal individual (Neal & Neal, 2013). Within the context of the POP, the exosystem includes school leadership because administrators make critical decisions related to school funding and policies that student microsystems, including teachers. Though budget and policy decisions impact students, administrators and the board of directors typically do not experience daily interactions with students, unless they have other roles within the school (e.g., administrators who are also parents of current students).

School finance. The experience and quality of school administrators and teachers impact student success (Misra, Grimes, & Rogers, 2012). Administrators determine access to resources through budgetary decisions and control of funding allocations (Mahoney & Khwaja, 2016; Polizzi, 2011). Therefore, budget and funding choices dictate priorities for school programming (Polizzi, 2011). These economic decisions often occur based on school market competition, particularly for private schools. In the private school market, schools must compete for student enrollment to increase financial revenue, as tuition income drives most private school budgets (Chakrabarti, 2008). When high competition exists, students' academic outcomes increase a school's performance, or output (Misra et al., 2012). Other potential factors contributing to a school's success that drive curricular decisions include college admission rates, graduation rates, and parental satisfaction (Marlow, 2010), indicating a lack of focus on IL and ML skills in students. Thus, if administrators do not consider IL and ML education when making financial decisions, those skills do not become a priority within the curriculum.

Administrator preparation. In the United States, 48 of 50 states do not require technology preparation for administrator licensure, and as a result, most administrator preparation programs do not include technology preparation courses in their curriculum (Schrum, Galizio, & Ledesma, 2011). The technology instruction that does occur in administrator preparation programs often focuses on data-driven decision making, not best practices for technology integration (Schrum et al., 2011). Furthermore, private schools do not require formal licensure of administrators, so individual experience and knowledge varies widely. Though preparation programs and licensure requirements do not include technology integration, school administrators have the potential to advocate and influence technology-related change (Mahoney & Khwaja, 2016; Polizzi, 2011; Schrum et al., 2011).

In a survey of 95 K-12 principals in Palermo, Italy, results indicated that principals' perceptions influenced their attitudes, which then influenced how they behaved and ultimately used technology (Polizzi, 2011). If a principal does not exhibit a positive attitude toward technology, then technology may not become a priority for the school. Of course, if technology does not become a priority, then IL and ML instruction will also suffer. As Considine et al. (2009) point out, technology provides novel forms of media—digital images, online text, videos, websites—that provide both motivation and opportunities for learning. Additionally, school leaders can influence individual teachers through the systematic establishment of a school culture that promotes and values exploration, innovation, and risk-taking when it comes to technology instruction (Schrum et al., 2011). While school leaders have the potential to influence change through personal practices including modeling use and positive peer pressure (Mahoney & Khwaja 2016; Schrum et al., 2011), contextual-level variables can influence administrators, making it difficult to implement change even when desired (Polizzi, 2011). However, a narrative study of six K-12 administrators from a mid-Atlantic state in the United States found that administrators' personal experiences formed the basis for understanding and advocating for ML use in the classroom (Mahoney & Khwaja, 2016). As administrators control access to resources, administrators influence what teachers can and cannot do in the classroom based on the resources available to them (Mahoney & Khwaja, 2016). The next section describes how teachers influence student learning.

School Microsystem: Classroom Teachers

Microsystems include social interactions directly surrounding the focal individual (Neal & Neal, 2013). Teachers directly engage with and influence students, therefore teachers exist within the school microsystem. Teachers also interact with the exosystem of school leadership. Change at the teacher level is critical to improving education, but it is also the most difficult place in which to achieve lasting change (Tyack & Cuban, 1995). Contributing factors that exist within the teacher microsystem include teacher attitudes, beliefs, and content knowledge related to IL and ML.

Teacher attitudes and beliefs. Teachers' beliefs influence their chosen instructional practices and thus impact the student learning experience (Shifflet & Weilbacher, 2015). Whether teachers use teacher-centered or student-centered practices, an impact on student learning occurs (Shifflet & Weilbacher, 2015). Teacher-centered practices include direct instruction (e.g., lecture), while student-centered practices provide classroom opportunities for student choice and collaboration (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012). An exploratory mixed-methods survey of 22 teachers in the southeastern United States found a positive correlation between teacher beliefs about effective technology use, epistemology, and classroom technology integration practices (Kim, Kim, Lee, Spector, & DeMeester, 2013). Classroom technology integration includes any technology use for teaching and learning within the learning environment, while effective technology use considers beliefs about teacher-centered or student-centered instructional methods. Epistemology considers teachers' personal beliefs on knowledge, learning, and teaching (Kim et al., 2013). The study suggested that teacher beliefs about classroom technology integration practices manifest in different ways within the classroom. Survey results indicated that teachers showed consistency between reported and actual behavior in the classroom. Thus, the authors concluded that when teachers exhibit positive beliefs toward technology, higher levels of technology integration occur (Kim et al., 2013). The factor of teacher beliefs about effective technology use, epistemology, and classroom technology integration practices on student learning impacts the POP because of the link between information, media, and technology. Through digital technologies, information users have access to an "unimaginable" amount of information (Rowlands et al., 2008, p. 293). However, barriers exist that impede teacher beliefs and practices regarding technology.

Teacher beliefs and practices about technology integration develop based on personal experiences of both internal and external barriers (Ertmer et al., 2012). External barriers include money, policies, and time—factors decided by leadership that teachers cannot control. Due to the volume of required curriculum, teachers find it difficult to incorporate additional instruction, claiming not to have enough time to include non-academic skills instruction (Deal, Flores-Koulish, & Sears, 2010). Internal barriers, or a teacher's personal beliefs, also impact how teachers integrate technology into the curriculum. An in-depth case study of 12 award-winning, technology-using K-12 teachers, found a strong alignment between teachers' classroom technology integration beliefs and practices (Ertmer et al., 2012). Teachers believed successful technology integration occurred when technology enhanced existing curriculum, extending beyond subject matter and allowing student choice. Based on data analysis and interview responses, the reasons teachers exhibited successful technology integration included increased access, a shift in student needs, and an increased desire to prepare students for digital age learning. However, teacher participants reported the attitudes, beliefs, knowledge, and skills of other, more reluctant teachers as the most impactful barrier to successful technology integration. Therefore, even though successful technology integration does occur in some classrooms, many teachers still do not integrate technology into their classrooms in meaningful ways. The study authors (Ertmer et al., 2012) defined meaningful technology integration as technology use that transforms the curriculum, indicating a fundamental shift in teaching and learning. One teacher described it as "a new pedagogy, a new way of doing school" (Ertmer et al., 2012, p. 431). The relationship between students and teachers, along with a focus on learning goals, facilitates meaningful learning (Limberg et al., 2008).

Teacher content knowledge. Both teaching students how to analyze media critically and teaching with multimedia sources requires varied approaches to instruction (Polizzi, 2011). Also, successful ML skills instruction requires that teachers possess their own understanding of ML. Currently, teacher preparation programs do not include IL or ML skills instruction as a component (Jolls & Wilson, 2014). Without adequate preparation, teachers will not be able to meet the needs of today's students, who often exhibit a poor understanding of effective information seeking strategies and often sacrifice critical analysis for ease of use and speed (Jolls & Wilson, 2014; Rowlands et al., 2008).

Another concern with the lack of teacher preparation is demonstrated when the opportunities to use IL and ML skills arise and teachers seem ill-prepared, focusing on basic uses of information and media (Schilder et al., 2016). Also, when teachers view content as isolated within specific subject areas, they do not support the integration of IL and ML, and do not incorporate critical content analysis (Jolls & Wilson, 2014). A lack of teacher preparation leads to a lack of teacher content knowledge, which contributes to the problem of students leaving school with insufficient IL and ML skills. The next section discusses contributing factors at the student level.

School Microsystem: Student as Focal Individual

The POP examines the lack of necessary IL and ML skills from the focal point of students. Due to the massive amounts of unregulated information online, Grafstein (2002) argues that students should learn IL skills in school. Of course, with global information access, teachers need different approaches to information, teaching, and learning (Limberg et al., 2008). The POP examines new approaches in the context of the classroom learning environment but focuses on the student perspective rather than teachers or other stakeholders. Student factors within the school microsystem include lack of student voice through teacher-centered instruction, student beliefs and self-efficacy, and student search strategies.

Teacher-centered instruction. As members of a global, connected community, students must learn to become active participants in the learning process and beyond (Stefl-Mabry, Radlick, & Doane, 2010). When asked through an online survey (N = 1,128) and as part of a focus group (n = 48), middle school and high school students from a district in the northeastern United States expressed that a teacher's knowledge and skill with technology integration impacts classroom instruction. Students also noted that a disconnect existed between classroom teachers and technology use in the world. As Collins and Halverson (2010) point out, digital technology provides constant access to adaptable, customizable information. Such ubiquitous information access means that learners, rather than being dependent upon teachers for information, can have their own say in the learning experience.

However, in a classroom with teacher-centered instruction, students do not have the opportunity to contribute their voice to the learning experience even as new technology tools (e.g., blogs, podcasts, vlogs, wikis) allow students to share their voice online (Geer & Sweeney, 2012). As the drawings of 347 primary school students in Australia revealed, technology can motivate students, but students do not have the capacity to determine best practices for effective learning with technology (Geer & Sweeney, 2012). This finding suggests that teacher guidance and support is necessary for meaningful learning with technology integration. In addition to teacher's beliefs and practices, student attitudes and beliefs also impact how students learn.

Student attitudes and beliefs. Students exhibit confidence in their ability to find and evaluate information, but often those same students exhibit unsophisticated evaluation skills, lacking "accuracy, objectivity, currency, and coverage" (Julien & Barker, 2009, p. 15). In open-ended, web-based tasks, ninth-grade Dutch students (N = 23) did not utilize information search and evaluation skills, even after reporting the value of those skills in group interviews (Walraven, Brand-Gruwel, & Boshuizen, 2009). Students reported familiarity with IL but did not put those skills into action, often sacrificing critical analysis for finding the easiest path to information. Therefore, even if a student may seem confident they could still have gaps in their IL and ML skills.

A national survey of youth between 11 and 18 years old (N = 2,747) found that young people recognized the importance of literacy skills but did not understand the application or purpose of those skills (Metzger et al., 2015). Also, students who exhibited an open perspective and interest in critical thinking put forth more effort in the evaluation of information, yet most students reported relying on their intuition or other people's assistance—thereby making them more trusting of online information in the evaluation process. Critical thinking relates to both affect and cognition, meaning that students with strong critical thinking capabilities tend to be more willing to engage in unfamiliar experiences (Kwon, 2008). A mixed methods study of 137 undergraduate students found that higher critical thinking skills translated to positive attitudes toward IL and the library in general (Kwon, 2008). Thus, critical thinking is an important factor contributing to students' IL skill levels.

Another aspect of students' beliefs that affects IL and ML skill development includes self-efficacy. Bandura (1977) describes self-efficacy as "expectations of personal mastery" (p. 193) that relate to individual performance in specific tasks. Self-efficacy includes an individual's belief in their potential success in achieving a task (Bandura, 1997; Ketelhut, 2007). Though self-efficacy and actual skill levels differ, a correlation can exist (Bandura, 1986). An exploratory study of 16 seventh-grade science classrooms in New York indicated a connection between self-efficacy and student academic success, or task performance (Ketelhut, 2007). Another mixed methods study of sixth-grade science classrooms in Texas found that a high self-efficacy had a greater impact on student performance than a negative attitude about the subject matter (Liu, Hsieh, Cho, & Schallert, 2006). These studies suggest a connection between self-efficacy and student success. In terms of IL, a survey of 585 Australian undergraduates found a positive relationship between motivation, IL self-efficacy, and lifelong learning (Ross, Perkins, & Bodey, 2016). Thus, students' IL self-efficacy is important to consider when addressing the gaps in IL skills because self-efficacy may impact skill development.

Student search strategies. A critical tenet of IL involves the information search process, or searching for and finding information (Hobbs, 2010; Julien & Barker, 2009; Koltay, 2011). One tool used during this process includes metacognition, or knowledge about the thinking process (Flavell, 1979). Though metacognition during the information search process can contribute to students experiencing increased success, student use of metacognitive skills tends to be inconsistent and unpredictable (Bowler, 2010; Tu, Shih, & Tsai, 2008). In a longitudinal study of Canadian high school students in an elective class ($N = 10$), students exhibited nonlinear search processes during an in-depth research assignment (Bowler, 2010). Some varying levels of metacognition occurred, but students did not appear to exhibit predictive skills. Rather, students used metacognitive skills in a reactionary way to fit immediate searching needs. A quantitative assessment of eighth-grade students ($N = 87$) in Taiwan indicated that students with better metacognitive skills produced higher levels of success in search outcomes (Tu et al., 2008). Also, students with more constructivist epistemological beliefs had higher quality search results. These results both indicate a relationship between metacognition and the information search process as an important part of IL skill development.

In a case study of a high school speech class ($N = 21$), students tended to use the first results they found rather than evaluating the credibility of websites or analyzing online information (Chung & Neuman, 2007). Though students exhibited some signs of interactivity with content, the students also frequently used serendipitous search strategies, looking for information at random by browsing and scanning content. Students expected to discover information at random with no structure to the search process itself. Rowlands et al. (2008) noted similar patterns in existing research on the search strategies of youth and noted that young people tend to prefer immediate, visual feedback when searching. For instance, first-year college students participated in a survey about Internet use ($N = 1{,}060$) and completed observed online search tasks ($n = 102$) to understand how students determine the credibility of online information (Hargittai, Fullerton, Menchen-Trevino, & Thomas, 2010). The three external factors that influenced students' information search processes the most included brand reputation, personal beliefs, and relationships with others. Reliance on external factors means that students do not use IL and ML skills when evaluating online content but rather utilize personal preferences or other more convenient methods.

Summary

The POP explores gaps in students' IL and ML skills. Students are the focal point of the POP, with the recognition that teacher practices, school leadership, school culture, and national educational trends influence the problem. Even though today's students grew up in a digital age surrounded by technology, students need additional instruction in IL and ML skills because "digital literacies and information literacies do not go hand in hand" (Rowlands et al., 2008, p. 306). The EST model frames the networked systems that directly or indirectly impact the student (Bronfenbrenner, 1994; Neal & Neal, 2013). Within the school microsystem, both students and teachers act as contributing factors to the POP because the attitudes, beliefs, content knowledge, and self-efficacy of both students and teachers affect students' ability to develop and use IL and ML skills within the classroom. The exosystem of school leadership does not interact with students but impacts them in an indirect manner through financial and other policy decisions. If school leadership does not prioritize IL and ML, then it will not be a priority within the school culture (Mahoney & Khwaja, 2016; Misra et al., 2012; Polizzi, 2011; Schrum et al., 2011). The macrosystem of school culture contributes to the POP because school culture affects curriculum and instruction. The professional context for this study, though innovative in some practices, tends toward traditional, teacher-centered instruction. However, IL and ML often conflict with traditional teaching practices and thus are at odds with the existing school culture, making institutional change difficult (Rantala, 2009; Tezci, 2011; Tyack & Cuban, 1995). At a broader level, the macrosystem of societal trends in education, such as high-stakes testing and economic changes within the workforce, contributes to the POP because high-stakes testing takes priority within the curriculum (Au, 2007; Madaus & Russell, 2010; Schilder et al., 2016). Lastly, the chronosystem examines the changes in the fields of IL and ML education. The evolution of IL to include digital and online sources means that traditional literacy instruction is no longer sufficient (Kellner & Share, 2007). Furthermore, the proliferation of media access and use means that ML education should shift to incorporate critical analysis and production of media (Daunic, 2011; Jolls & Wilson, 2014; Koltay, 2011).

The needs assessment explored both student and teacher-related factors contributing to the POP. A needs assessment helped to establish the POP within the professional context, including student attitudes, beliefs, skills, and teacher attitudes and beliefs. The next chapter outlines the needs assessment including the context of study, methodology, findings, and discussion.

Chapter 2 – Empirical Examination of Underlying Factors

This chapter presents findings from a needs assessment that examined the existing IL and ML skills of students at an all-girls private school. The needs assessment addressed several constructs including students' new media literacy (NML) skills, students' IL and ML skills in the classroom, students' IL skills self-efficacy, and teacher beliefs about the role of IL and ML in education. The chapter includes a description of the professional context, purpose statement, research questions, and methodology. It concludes with an explanation of findings and discussion of POP connections.

Context of Needs Assessment

An all-girls private middle and high school served as the professional context for this research study, heretofore referred to as Harper Valley School. The school has a history of over 150 years of single-gender education. It sits in a wealthy suburban neighborhood in the southeastern United States. Students come from several surrounding counties and matriculate from both private and public schools. In the 2016-17 school year, the school enrolled 686 students in fifth through twelfth grade, with 14% students of color and 16% of students receiving partial need-based financial aid. The researcher worked as a full-time academic technology specialist at the school, interacting with faculty and students in all grade levels and subject areas.

Harper Valley School adopted a fully 1:1 student-to-device ratio in 2005, with each student and teacher receiving a laptop. Models vary by grade level, but all laptops possess features to convert from laptop to tablet mode, touchscreen capabilities, Windows operating system, and a full suite of educational software. The campus provides wireless Internet access, with wireless projectors in each classroom. Teachers and students utilize

PowerSchool Learning, an online learning management system, to deliver course content as part of classroom instruction. Harper Valley School also uses Atlas curriculum mapping software, Google Apps for Education, Microsoft Office, Veracross student information management software, and a variety of other software and web-based tools. The middle (grades 5-8) and upper (grades 9-12) schools each have a full-time academic librarian. In addition to the academic technology specialist and academic librarians, other library and technology staff include the library and information services director, technology director, server and imaging engineer, help desk technician, database manager/website coordinator, administrative assistant, and resource librarian.

Students do not receive dedicated instruction toward library and technology skills; rather, library and technology staff collaborate with teaching faculty to integrate those skills into the existing classroom curriculum. While the department uses an informal, internal IL and technology skills matrix for instructional purposes, a standardized classroom curriculum does not exist. Additionally, the faculty is not held accountable for library and technology skills at a systemic level. Furthermore, though collaboration does occur, teachers are not required to collaborate.

Purpose of Needs Assessment

The needs assessment examined students' IL and ML skills in the classroom using several exploratory research questions as a guide. The researcher designed the needs assessment to understand how the POP manifested itself within the eighth-grade class at Harper Valley School. The needs assessment addressed several constructs within the POP including students' NML skills, students' IL and ML skills in the classroom, students' IL skills self-efficacy, and teacher beliefs about IL and ML in education.

The following definitions informed the needs assessment. IL is the ability to access, analyze, evaluate, create, reflect, and act upon multiple sources of information (Hobbs, 2010). ML is the ability to critically evaluate and use different information and media sources (Aspen Task Force on Learning and the Internet, 2014; Stanford History Education Group, 2016). NML encompasses a variety of competencies and skills related to ML including appropriation, cognitive interaction, collaborative knowledge, discovery, experimental problem-solving, judgment, negotiation, networking, multitasking, simulation, and transmedia navigation (Jenkins, Clinton, Purushotma, Robison, & Weigel, 2006). Self-efficacy considers the beliefs that individuals have in their mastery of specific tasks (Bandura, 1977). Finally, teacher beliefs consider the extent to which teachers' beliefs about technology integration impact the classroom and thus student learning (Ertmer et al., 2012; Kim et al., 2013). The needs assessment research questions (NARQs) were addressed through an integrated mixed-methods approach to data collection and analysis.

The NARQs included:

NARQ1: How do students exhibit NML skills?

NARQ2: How do students exhibit IL and ML skills in the classroom?

NARQ3: How do students perceive their IL self-efficacy skills?

NARQ4: What do teachers believe about IL and ML?

Needs Assessment Methodology

The needs assessment addressed digital age learning—in particular, IL and ML—with the student as the focal individual within an ecological system (Neal & Neal, 2013). The needs assessment design included an integrated mixed-methods approach with a quasi-experimental design. An integrated mixed-methods approach incorporates both quantitative and qualitative methods as well as views all findings together during the analysis process (Schutt, 2015). This type of approach allowed the researcher to examine the problem using multiple data sources and data triangulation (Schutt, 2015). Due to the limited sample size availability, the researcher had to use a quasi-experimental design, meaning that random assignment of participants into different groups did not occur (O'Leary, 2014). The methodology described in this section includes information on participants, instrumentation and measures, and data collection.

Participants

The target population for the needs assessment included a convenience sample of all eighth-grade students ($N = 87$) and eighth-grade teaching faculty ($N = 13$) of academic courses. Teachers of academic courses included English ($n = 2$), foreign language ($n = 4$), social studies ($n = 2$), math ($n = 3$), and science ($n = 2$).

Classroom observations. While all teachers participating in the survey indicated a willingness to participate in classroom observations, the researcher chose to observe the two social studies teachers as a convenience sampling. These teachers were willing and available during the observation period. Observations occurred in the first 30 minutes of Ms. MB's E block (first observation), B block (second observation), and Mrs. ML's D block (third and fourth observation). Ms. MB, a white female, has a Master's degree, 12 years of teaching experience, and five years of teaching experience at Harper Valley School. Mrs. MB, a white female, has a Master's degree, 14 years of teaching experience, and eight years of teaching experience at Harper Valley School. Class blocks last 50 minutes for a total of three hours of observation. Each class contained between 12 and 16 students with no specialized grouping. Therefore, though demographic information was not collected as part of the observations, the classes reflected the eighth-grade population.

Measures

The study included both quantitative and qualitative methods. Quantitative methods consisted of student and teacher surveys. Qualitative methods consisted of field notes during classroom observations.

Student survey. The student survey for the needs assessment (see Appendix A), created in Qualtrics, addressed NARQ1 and NARQ4. It contained 57 questions, with demographic questions and selected portions of two different existing instruments.

Demographic questions. The two demographic questions on the survey asked students' age and ethnicity in a multiple-choice question format. The survey did not ask students' gender because Harper Valley School is an all-girls school. However, some students may not identify as female, thus future dissertation research should include a demographic question on gender identity to be inclusive of all students. The questionnaire did not ask about students' family income because students likely do not have accurate or complete information about their family financial situation.

New Media Literacy Questionnaire. Select sections were administered from the NML Questionnaire that assesses students' NML skills (Literat, 2014). Part 2, Digital Participation, and selected subgroups from Part 3, Assessing the 12 NML Skills, were included. Part 2 (7 questions) included a mixture of question types including three yes/no questions, two matrix tables, a 4-point Likert-type scale question, and one short response. Part 3 (30 questions) included 5-point Likert-type scale questions from the following

NML subgroups: appropriation, distributed cognition, collective intelligence, judgment, networking, and visualization (NARQ1). Students completed the NML subgroup questions in randomized order. The overall internal consistency reliability of the scale was reported as Cronbach's alpha 0.90, indicating a high reliability. Though Literat (2014) did not report specific reliability scores for the subgroups, the author made a statement that additional reliability testing indicated satisfactory reliability for each of the subscales (Literat, 2014). The researcher also added one open-ended question to the student survey that asked students for their definition of ML.

Information Literacy Self-Efficacy Scale. The student survey also assessed students' feelings toward IL (NARQ3) using the 17-item version of the Information Literacy Self-Efficacy Scale (ILSES; Kurbanoglu, Akkoyunlu, & Umay 2006) with a 7-point Likert-type scale for each question. The scale includes questions assessing basic, intermediate, and advanced IL skills. For each question, the researcher converted the 7-point Likert-type scale answers into numerical scores ranging from 1 (*almost never true*) to 7 (*almost always true*). In initial research, Kurbanoglu et al. (2006) calculated the internal consistency reliability of the 17-item scale at 0.82, indicating high reliability, and determined a positive correlation between subscales and the total score. It was also concluded that the scale successfully measures the underlying construct .

Teacher survey. The teacher survey (see Appendix B), created in Qualtrics, addressed NARQ4. It contained 53 questions, with demographic questions (7 questions) and selected portions of an existing instrument, the Media Education Survey (Yates, 1997) on teachers' perspectives of media education.

Demographic questions. The demographic questions included gender, ethnicity, and highest degree obtained in a multiple-choice question format. Additional demographic questions included fill-in-the-blank questions on the number of years teaching total and the number of years teaching at Harper Valley School. Finally, the demographic questions section asked teachers to select which grades and subjects they taught in two separate questions with a checkbox format.

Media Education Survey. The sections from the Media Education Survey included Goals for Media Education (13 questions), Appropriate Place for Media Education (5 questions), Student Media Understanding Competencies (7 questions), Barriers to Media Education (7 questions), and Student Understanding of Mass Media (12 questions). Question types included a 7-point Likert-type scale, 7-point slider scale, and 10-point slider scale. For the Likert-type scales answers were converted into numerical scores ranging from 1 (*strongly agree*) to 7 (*strongly disagree*). For the complete survey, Yates (1997) reported Cronbach's alpha at 0.89, indicating a high internal consistency reliability of the instrument. The researcher also added two open-ended questions to the teacher survey that asked teachers for their personal definitions of IL and ML.

Classroom observations. Classroom observations aimed to provide insight into NARQ2. Through classroom observations, the researcher recorded anecdotal, electronic field notes (Schutt, 2015). Being a participant observer allowed the researcher to observe but also ask questions, providing additional insight into classroom activities. Over four class periods within several sections of eighth-grade social studies class, the researcher generated 16 pages of double-spaced notes, including transcribed handwritten notes from the first observation. The researcher analyzed classroom observations by using inductive reasoning to discover themes, allowing the data to speak for itself (O'Leary, 2014).

Procedure

Data collection occurred during the months of April and May 2017. The researcher administered the student survey in-person during the school day and the teacher survey remotely via email. The researcher sent both surveys as a link through a school email account. Classroom observations occurred for three hours total between February and May 2017 in several sections of eighth-grade social studies with both eighth-grade social studies teachers.

Student survey. Of the eighth-grade student population (*N* = 87), 27 students' parents completed consent forms (see Appendix C) for a 31% response rate. Of the students that had completed parental consent forms, 17 students completed the survey (*n* = 17) for an overall participation rate of 19.5%. Students completed an online survey (see Appendix A) using an anonymous link sent to them via email. Students completed the survey during a regularly scheduled study hall using their school-issued laptops.

Survey participants included all female students in the eighth grade with an average age of 13.8 years. All but one student reported their ethnicity as White. The one non-White student mentioned to the researcher that she was mixed race, but reported herself as African-American because the ethnicity question was erroneously created as a multiple choice and not a checkbox question. Within student respondents, only one student of color participated (6% of survey participants), indicating a possible underrepresentation of students of color (14% of overall student population).

Quantitative data analysis of the student survey occurred in Qualtrics by calculating basic descriptive statistics of minimum, maximum, mean, and standard deviation for each multiple-choice or Likert-type question. The digital participation questions (e.g., 0-2 hours, 3-5 hours) were already categorized on the survey, so the researcher calculated percentages for those questions based on frequency of responses. For each question in Section 3 of the NML Questionnaire, the researcher tallied answers into numerical scores ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), with a max score of 25 points for each subgroup. Thus, higher scores would indicate that a student strongly agreed with the question statements in that subgroup, while lower scores would indicate that a student strongly disagreed with the question statements in that subgroup. The open-ended question asking students for their definition of ML was not included in data analysis due a low response rate of only two students. Data from the ILSES was analyzed in Qualtrics by calculating basic descriptive statistics of minimum, maximum, mean, standard deviation, and variance for each item (see Appendix D).

Teacher survey. All eighth-grade faculty ($N = 24$) received a link to the teacher consent form and subsequent survey (see Appendix B), however, due to the nature of the study, only teaching faculty of academic courses ($N = 13$) were included in the needs assessment. Of the target population, nine teachers completed the survey for a 69% participation rate. The researcher discarded one submission because the survey only contained demographic information and had no other question responses.

Demographic questions. All teachers reported their gender as female. Most respondents identified as White, with one participant identifying as Asian and one participant identifying as Hispanic. Teachers reported a Master's (67%), Doctorate

(22%), or Bachelor’s (11%) as their highest earned degree. The average teaching experience reported was 11.7 years, and the average teaching experience at Harper Valley School was 6.6 years. The original sample included one male teacher who did not participate in the survey. Otherwise, the teacher respondents appeared to be representative of the original group, and respondents included teachers from all academic subject areas. Of the original sample, the highest earned degree of teachers was a Master’s (77%), Doctorate (15%), or Bachelor’s (8%) and the average teaching experience at Harper Valley School was 6.8 years. The total teaching experience for teachers not participating in the survey was not available to the researcher. Quantitative data analysis of the teacher survey occurred in Qualtrics by calculating basic descriptive statistics of minimum, maximum, mean, and standard deviation.

Classroom observations. All observations occurred within social studies classes and included two different teachers. For the February observation, the researcher generated handwritten notes and then transcribed them into Microsoft Word. The observed class consisted of a quiz review as well as question and answer time. The researcher only observed half of the class period because the other half of the class consisted of students watching a video. For the three May observations, the researcher generated electronic notes in Microsoft Word. The May observations included the beginning days of an independent student research project. Two of the observations occurred within the same class section.

Qualitative analysis of classroom observations occurred through several steps of deductive reasoning. First, the researcher generated field notes in Microsoft Word. Then, the researcher read through the field notes without taking any notes. Next, the researcher read through the field notes again and labeled the text, searching for patterns of meaning. Then, the researcher shared the field notes with a colleague for additional feedback. A final read-through the field notes identified themes discovered from the observations. The next section includes a discussion and summary of findings.

Needs Assessment Findings

As the POP is student-focused, the researcher approached the findings with a student-centered perspective. However, this section presents findings for all research questions and related measures. The findings are organized by topics generated from the NARQs. Statistical analysis occurred within the Qualtrics survey system. Analysis of classroom observations occurred within the app Notability and the word processing program Microsoft Word.

Students' New Media Literacy Skills

NARQ1 addressed what NML skills look like for students in school and at home. Due to time constraints and participation limitations, a skills assessment did not occur. Rather, students self-reported on NML skills through an existing survey instrument, the NML Questionnaire (Literat, 2014).

Digital participation. All students reported having access to a computer and the Internet at home. Students reported spending the greatest amount of time on the Internet for school or work, with most students (70%) reporting nine or more hours online per week (see Table 2.1). Almost half of the students (47%) also reported spending six or more hours on the Internet per week in their free time (see Table 2.1). Additionally, students reported lower hours of participation in social networking, creating and publishing online, and gaming (see Table 2.2).

Table 2.1

Student Digital and Non-Digital Participation Frequencies

How many hours a week do you generally spend:	0-2 hours	3-5 hours	6-8 hours	9-11 hours	12+ hours
On the Internet for school or work	0	3	2	5	7
On the Internet in your free time	2	7	2	1	5
Watching TV (not on your computer)	8	6	2	0	1
Reading books, magazines, or print newspapers	7	5	3	0	2
Playing games (online, on your cell phone, on PlayStation, Wii, etc.)	13	2	2	0	0

Table 2.2

Student Digital Participation Frequencies by Platform

On average, how many hours a week do you spend on:	0-2 hours	3-5 hours	6-8 hours	9-11 hours	12+ hours
Facebook	17	0	0	0	0
Twitter	17	0	0	0	0
YouTube	7	7	1	2	0
Instagram/Snapchat, other social networking sites	4	8	2	2	0
Messaging Apps (GroupMe, etc.)	11	2	0	3	1
Games (digital) – by yourself	14	2	1	0	0
Games (digital) – with other players	14	2	1	0	0
Blogging (Blogger, Tumblr, etc.)	16	1	0	0	0
Podcasting	17	0	0	0	0

Aggregate subgroup scores. The researcher calculated the indexed scores on the questions for each NML subgroup (see Table 2.3). Assessed subgroups included appropriation, distributed cognition, collective intelligence, judgment, networking, and visualization. The survey included five questions in each of the six subgroups, or 30 questions total. In examining the basic descriptive statistics from the indexed scores, the standard deviation for each subgroup indicated a wide range of results. This range may be due to an unknown difference in skill level of participating students or the limited sample size. The subgroup of visualization exhibited the highest mean aggregate score of 20.18 out of a possible 25 points. The visualization subgroup also exhibited the lowest standard deviation of 1.58. These results indicate that students self-report possessing higher levels of visualization skills more than other NML skills. Visualization skills consist of “the ability to create and understand visual representations of information” (Literat, 2014, p. 17). The subgroup of networking skills exhibited the lowest mean aggregate score of 15.94 out of a possible 25 points, indicating a possible area of improvement. Networking skills consist of “the ability to search for, synthesize, and disseminate information” (Literat, 2014, p. 17). Other indications of networking skills include “hyperlinked interconnectedness” (Literat, 2014, p. 21), multimedia creation and distribution, participation in a global community, and social media use.

Table 2.3

Student Indexed Subgroup Scores of NML Skills

NML skill	Mean	SD	Minimum	Maximum
Appropriation	17.82	2.79	13	23
Distributed Cognition	20	2.22	16	25
Collective Intelligence	19.71	1.74	16	23
Judgement	19.18	2.01	16	24
Networking	15.94	2.1	12	19
Visualization	20.18	1.58	19	25

Individual questions on New Media Literacy Questionnaire. The researcher calculated the descriptive statistics for each question in the NML skills subgroups (see Appendix E). Most questions (n = 23) exhibited a mean score above 3.5, indicating a positive response from students. Five questions exhibited a mean score between 3.0 and 3.5, indicating a moderate response from students. Moderate responses came from questions from multiple subgroups including questions 4.1 and 4.3 (appropriation), 4.13 (collective intelligence), 4.16 (judgement), and 4.24 (networking). Only two questions exhibited a mean score below 3.0, both of which occurred in the networking subgroup. Question 4.22 stated: "I like to share my favorite links or creative work on social media sites like Facebook or YouTube or Twitter" (Literat, 2014) and had a mean score of 2.53. Question 4.23 stated: "I often share links on Facebook, Twitter, my blog, etc." (Literat, 2014) and had a mean score of 2.41.

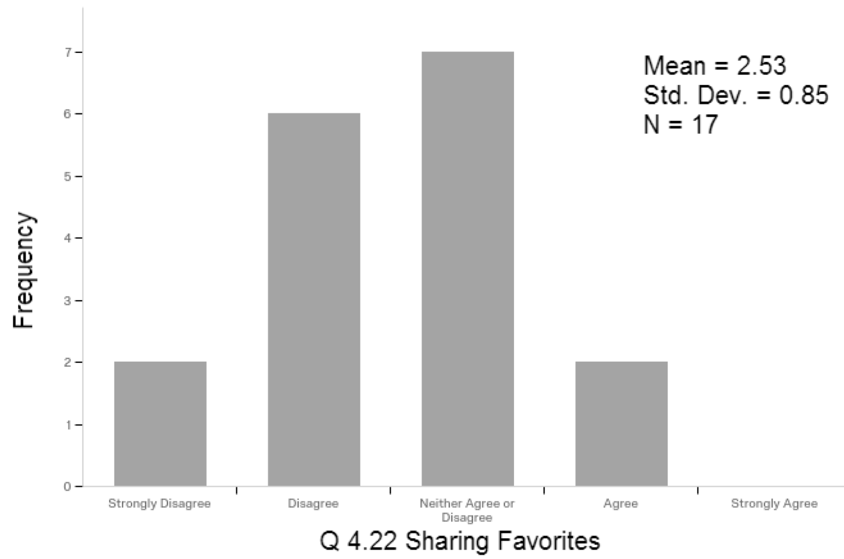


Figure 2.1. Bar chart indicating survey participants' responses to question 4.22 on sharing creative work to social media.

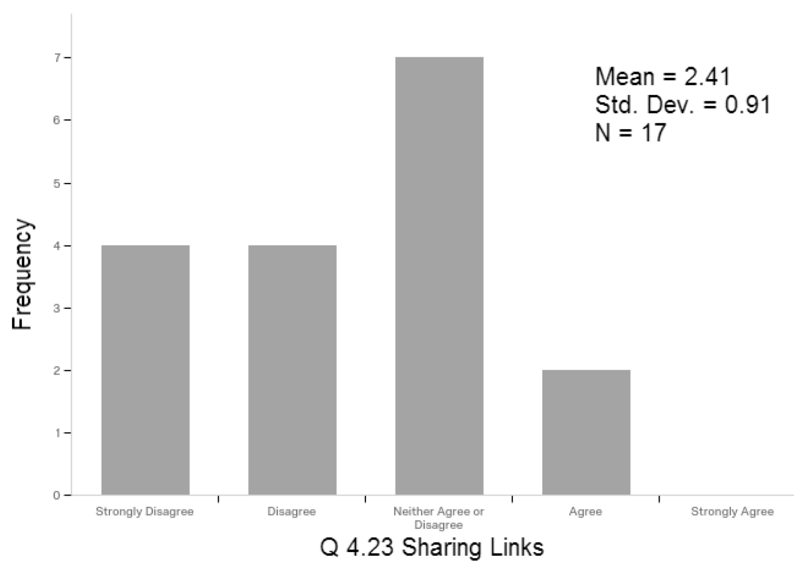


Figure 2.2. Bar chart indicating survey participants' responses to question 4.23 on sharing links to social media.

Student Skills in the Classroom

NARQ2 addressed how students exhibit IL and ML skills in the classroom. Classroom observations aimed to address these questions using the qualitative paradigm. During the first observation in Ms. MB's E block, students spent the first half of class reviewing a quiz and conducting a question-and-answer session on class content. The second half of the class period students watched a movie and took notes. During observations, the researcher paid attention to the type of dialogue occurring (e.g., casual conversation, questioning). Observed dialogue between students and teachers included both factual recall (e.g., "What is the Truman doctrine?") and critical thinking questions (e.g., "Didn't soldiers think that [indirect conflict of the United States in the Vietnam War to oppose the communist regimes of China and the USSR] was pointless?").

The second observation, Ms. MB's B block, occurred during an introductory and exploratory lesson on how to use different electronic databases available through the school library. First, Ms. MB provided context for the lesson and solicited student feedback. Then, she provided students with guided exploration through four different electronic databases—each for between five and 10 minutes—with student-student and student-teacher dialogue happening throughout. Finally, Ms. MB allowed students 15 minutes of independent exploration time while she conferenced with individual students.

Topics of interest revealed in the analysis process for the second observation included: exploring databases, finding information, filtering results, and expressing student attitudes. The purpose of exploring the different databases was to prepare students for an upcoming independent student research project. Thus students, needed to be able to find and select appropriate information from each database. Ms. MB provided structure to the guided exploration to ensure all students understood the basics before moving on to independent exploration. Dialogue during the guided exploration allowed students to ask questions and the teacher to provide additional assistance as needed. Ms. MB also used language to instruct throughout, with comments like "That's [Lexile range] librarian speak" or encouraging students to use more basic reading levels during the initial stages of researching a topic. Students' initial attitudes toward different databases tended to be negative, with students often quick to state displeasure using general statements such as "I don't like it".

The third observation, Mrs. ML's D block, occurred during the first day of library work time for the independent research project. Due to a misunderstanding between Mrs. ML and librarian, the librarian had scheduled a different class at the same time and thus did not attend the observed class. Thus, the teacher improvised the lesson, providing context for the overall project and then telling students to discuss their topics of interest in small groups of three or four while she had one-on-one conversations with each student. Mrs. ML interspersed whole-class announcements throughout the discussion time, mostly centered around how to explore a topic. Students were eager to begin gathering information, but Mrs. ML emphasized the importance of exploring topics and generating keywords before information gathering.

The fourth and final observation occurred during the subsequent class period of Mrs. ML's D block. The librarian, Mrs. B, also participated in the class. She began by asking students to describe the project and share example topics. Through whole-class dialogue, Mrs. B reinforces library skills instruction with statements such as "You are not reading the entire book. You are going to scan, skim, look for topics within the book or viewpoints" and "Make sure that you find a second source to back information up". After whole-class instruction, students worked individually or in small groups while the librarian and teacher walked around to assist students as needed. At this point in the lesson, the researcher also walked around and questioned students about their research. Students began looking for sources using the electronic library catalog or browsing books pre-selected by the librarian. Several students who used the library's online catalog search needed assistance with locating the physical book within the library, indicating a lack of awareness of the Dewey decimal system.

Overall findings included a great deal of dialogue—students engaged in frequent conversations, both with each other and the teacher. Though conversation occurred during a variety of activities throughout each lesson, the dialogue tended to be on topic and related to classroom instruction. Teachers utilized language to guide students through the research process and to reinforce existing skills. The researcher noted that students needed guidance in the research process. Librarian and teacher dialogue focused on the beginning steps of research including choosing a topic, exploring a topic using keywords, and source searching. Additionally, students asked questions about research that indicated either a lack of confidence or knowledge in research skills.

Students' Information Literacy Skills Self-Efficacy

NARQ3 addressed how students perceive their IL skills with a focus on self-efficacy. The researcher analyzed student responses from the ILSES (Kurbanoglu et al., 2006). The researcher used basic descriptive statistics to analyze the 17-item ILSES for each student (see Appendix D). The standard deviation for questions in the ILSES ranged from 1.07 to 1.79. For most questions, students responded with high levels of self-efficacy. All but one question had a mean that fell within the range of 4.18 to 6.18 out of a possible score of 7. These results indicate that students almost always felt confident when using their IL skills. One question had a mean score of 3.94, the lowest score, which stated: "I feel confident and competent to create bibliographic records and organize the bibliography" (Kurbanoglu et al., 2006). A similar question stated: "I feel confident and competent to create bibliographic records for different kinds of materials (i.e. books, articles, web pages)" (Kurbanoglu et al., 2006) and had a mean score of 4.18, the second lowest score. These results indicate a possibility of low self-efficacy in students related to creating bibliographic records.

Teacher Beliefs about Information and Media Literacy Education

NARQ4 addressed teacher beliefs about IL and ML in education. Though the POP focuses on students, teachers directly impact student learning, and thus the researcher wanted to gain insight into teachers' beliefs about IL and ML. Due to time constraints, teacher interviews did not occur during the needs assessment. Instead, the researcher analyzed the results from a teacher survey adapted from an existing instrument, the Media Education Survey, on teachers and ML education (Yates, 1997). The survey was designed to measure teachers' perspectives on media education.

Importance of media education. Teachers agreed on the importance of educating students about media. For questions related to the importance of media education (questions 3-18), all respondents reported that they agree or strongly agree on a 7-item Likert-type scale. Teachers also agreed that all levels of school including elementary, middle, and high school should teach media education. On these questions (questions 19-21), all but one teacher indicated agreement, except for one respondent who reported neither agree or disagree on the question about media education in elementary school. One question (see Table 2.4) asked teachers to rate the importance of students' understanding of different elements of mass media on a scale ranging from 1 (*not at all important*) to 10 (*very important*). The standard deviation for each element ranged from 0.67 to 2.23. The mean score for each element ranged from 6.38 (history of media) to 9.56 (potential effect of media messages on people), indicating that teachers believe in the importance of student understanding of different mass media elements.

Table 2.4

Teachers' Beliefs on the Importance of Teaching Different Mass Media Elements

Mass media element	Mean	SD	Min.	Max.
Demographics/personal characteristics of media staffers	6.56	1.71	4	9
Economic factors/foundations in media	7.33	1.7	5	9
Ethics in media	8.67	0.94	7	10
Future/trends in media	6.67	2.16	1	8
History of media	6.38	2.23	1	9
Legal rights/restrictions related to media	7.89	1.52	5	10
Potential effect of media messages on people	9.56	0.68	8	10
Problems associated with news reporting	9.33	0.67	8	10
Public perceptions of media and media staffers	8.33	1.05	7	10
Roles and responsibilities of media in society	9.22	0.63	8	10
Structure/procedure/policies in media	6.89	2.18	2	10
Technologically related aspects of media	7	1.94	3	10

Barriers to media education. The teacher survey revealed teachers' perceptions of challenges toward implementing media education. Most teachers reported a lack of time (89%) and teacher training (67%) as the most significant barriers (see Figures 2.3 & 2.4).

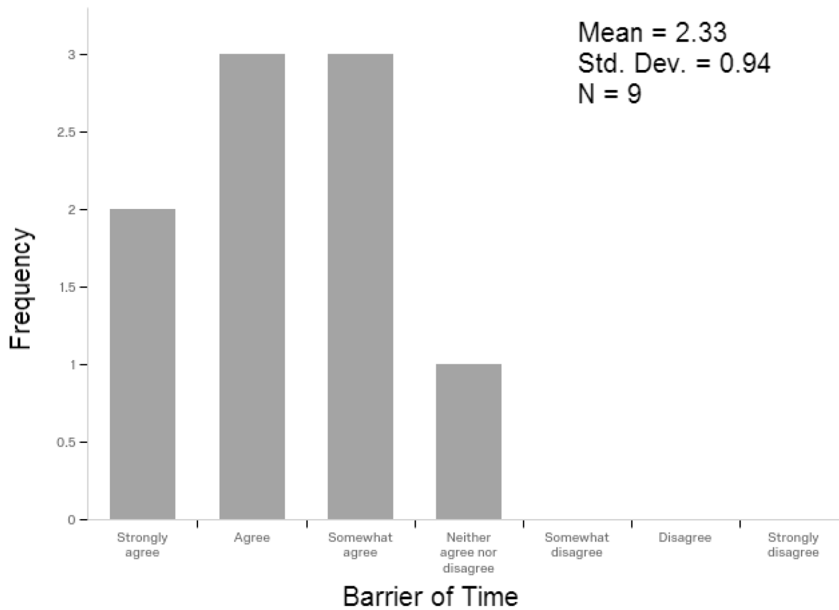


Figure 2.3 Bar chart of participants' responses to Question 31 on the lack of time as a barrier to media education.

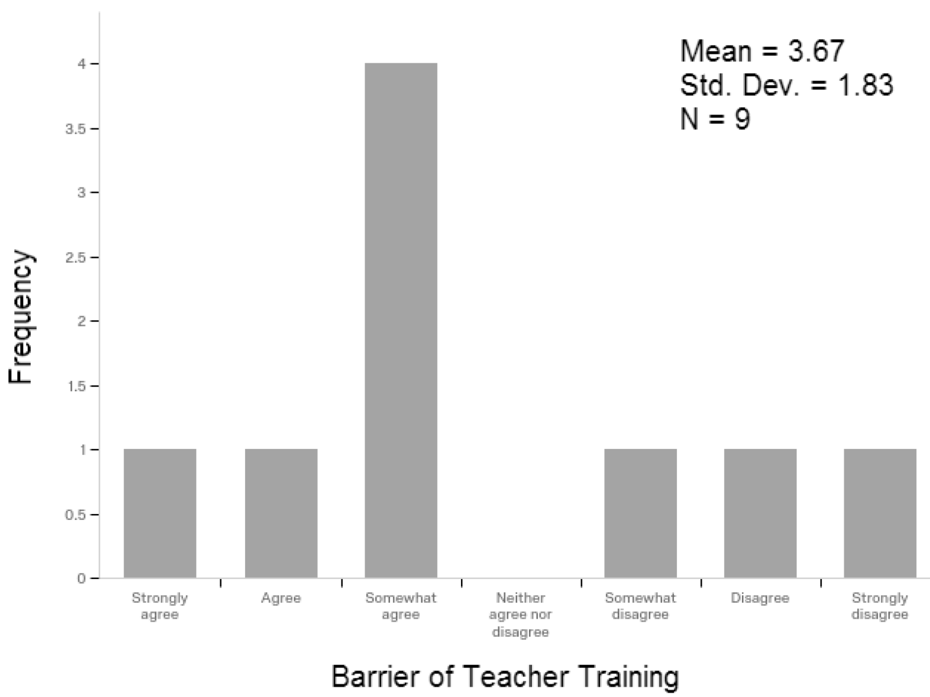


Figure 2.4 Bar chart of participants' responses to Question 28 on the lack of teacher training as a barrier to media education.

Teacher perceptions of students' media use. One section of the teacher survey asked teachers to rate students' competencies in various elements of media use on a scale of 1 (*not competent*) to 7 (*highly competent*). The survey did not define terms for the teachers. No question had a mean higher than 4.22, indicating that teachers report low competence in students (see Table 2.5). The standard deviation of elements ranged from 0.79 to 1.55, meaning most teachers provided similar responses. The question with the lowest mean asked teachers about students' ability to limit their own media use, with a mean score of 2.67. These results indicate that teachers do not believe students can limit their personal media use, potentially impacting the classroom experience.

Table 2.5

Teachers' Beliefs on the Importance of Teaching Different Mass Media Elements

How competent are your students at:	Mean	SD	Minimum	Maximum
distinguishing program content versus ads?	4.22	1.55	2	7
distinguishing fictional content from reality?	4	1.15	2	6
identifying values portrayed in media?	4.22	0.92	3	6
choosing media content that is valuable and useful to them?	3.67	1.25	2	5
analyzing program values (e.g., identifying prejudice, recognizing stereotypes)?	4	1.25	2	6
realizing the need to limit their media use?	2.67	1.15	1	4
creating media content?	4.22	0.79	3	4

Needs Assessment Discussion

As indicated in the survey responses, teachers see ML education as important, which supports exploration of the POP at Harper Valley School. The main barriers teachers reported to implementing ML education included time and teacher training. The literature supports these results, with teachers often reporting a lack of time as a major barrier to technology integration of any kind (Deal et al., 2010; Ertmer et al., 2012). Teachers also reported low ratings of students' competencies in media use, indicating a need to address ML skills with eighth-grade students at Harper Valley School. Though the teacher portion of the needs assessment did not directly address IL skills, overlap exists between the two skills.

Based on the student survey results from the ILSES questions, students appear confident in their IL skills. The literature supports this conclusion of student confidence, but also indicates that students report higher levels of confidence and understanding than actual skill levels (Julien & Barker, 2009; Metzger et al., 2015; Walraven et al., 2009). This suggests that even though students self-reported confidence in IL self-efficacy, this may still be an area of need to address in the intervention. However, the needs assessment did not assess the relationship between students' beliefs and skill levels.

Based on the NML skills questions, students most consistently self-reported strong visualization skills (e.g., creating visual representations of information) and low networking skills (e.g., disseminating learned information) scores. The questions with the lowest scores indicated that students do not like to share creative work or other online content through links on social media. Furthermore, students reported spending little time (0-2 hours per week) creating and publishing online through activities such as blogging or podcasting. A potential intervention could help students develop networking skills. However, the researcher is concerned about the practicalities of implementing such an intervention due to school culture, which discourages student publications outside of the classroom or school environment.

Students self-reported a lack of skill in bibliographic reporting, indicating a perceived gap in skills. Additionally, classroom observations revealed that students exhibited inadequate research skills, particularly in the initial stages of research. Students wanted to begin finding and gathering information before thoroughly exploring a topic or developing keywords. Once students began to research, some had difficulty using the electronic library catalog to find sources while others had trouble finding physical books on the shelves of the library. A potential intervention could help students develop research skills with a focus on any of the following stages of research: choosing a topic, creating a research question, generating keywords, searching for information, locating information sources, and creating bibliographic records. The information search process seems to be the most practical area for intervention as it addresses gaps evident in both the literature and needs assessment within the professional context. Also, while the needs assessment addressed both IL and ML skills, the intervention design should be more focused for practical purposes. The next chapter will review existing literature on possible interventions for addressing identified gaps in students' IL skills.

Chapter 3 – Strategies for Information Literacy Skills Instruction

Many different strategies exist for developing students' IL and ML skills. However, to narrow the scope of the intervention research, this chapter focuses on discussion of interventions that support the development of students' IL skills, particularly during the information search process. First, a summary of results from the needs assessment provides context for the intervention research. Then, the researcher outlines the guiding conceptual and theoretical frameworks, discusses interventions presented in existing literature, and makes a case for the proposed intervention.

Summary of Needs Assessment

The purpose of the needs assessment was to explore potential gaps in students' IL and ML skills at Harper Valley School. It addressed several constructs including students' NML skills, students' IL and ML skills in the classroom, students' IL skills self-efficacy, and teacher beliefs about ML in education. The researcher used a mixed-methods design to collect and analyze both quantitative and qualitative data.

Teachers indicated a need for including ML education in the curriculum at all levels, but cited a lack of time and teacher training as primary barriers. Students self-reported strong visualization skills and weak networking skills. Also, students self-reported a lack of interest in creating, publishing, and sharing content online, stating a preference instead for interacting with existing content. Students self-reported high self-efficacy toward IL except for the skill of creating bibliographic records. However, classroom observations suggested that student self-efficacy may not match actual skills, as students struggled with early stages of research including choosing a topic, generating keywords, and locating information sources.

While the needs assessment addressed multiple constructs related to the POP, exploration of intervention research will focus on a more targeted area for intervention to be effective in research design and implementation. Thus, further exploration of the literature focuses on finding ways to support development of students' IL skills, particularly during the information search process. The next section describes the conceptual and theoretical frameworks that were used to guide intervention research.

Conceptual and Theoretical Frameworks for Intervention Research

A research framework guides question formation, research design, and methods (Lester, 2005). A theoretical framework relies on a formal theory or theories (Eisenhart, 1991; Lester, 2005). On the other hand, a conceptual framework is an argument for using certain concepts and ideas to guide research (Eisenhart, 1991). Both conceptual and theoretical frameworks acted as guides for exploring potential interventions. First, cognitivism and constructivism will be discussed as two separate but related learning theories that contribute to understanding potential interventions for developing students' IL skills. Then, the conceptual framework of the information search process (ISP) model (Kuhlthau, 1990) will be discussed as an additional guide for intervention research.

Cognitivism: A Theoretical Framework

The cognitive perspective states that learning does not occur in isolation. Rather, learning relies on a variety of factors including behaviors, cognitive skills, and environmental factors (Bandura, 1986). Cognitivism relates to IL because it also does not occur in isolation. Instead, IL includes using information for a purpose (Partnership for 21st Century Learning, 2015), with a focus on literacy during the research process

(Hobbs, 2010). Research does not occur in isolation, rather, individuals choose to research specific topics within a subject area or topic.

Cognitivism began in the late 1950s when behaviorism began to experience a decline in popularity (Ertmer & Newby, 1993). It gained further traction during the 1970s due to the further decline of behaviorism along with the increase of computer technological capabilities (Bruning, Schraw, & Norby, 2011). In addition to advanced computing power, the computer acts as a metaphor for the processing power of the human mind (Bruning et al., 2011). The fundamental principle of cognitivism is a focus on the mental processes that contribute to learning. Cognitivism considers human memory, perception, and thought as critical components of information processing, or the learning experience (Bruning et al., 2011; Schunk, 2012). The concept of triadic reciprocality furthers the tenets of cognitivism as it considers learning a combination of behavior, cognition, and the learning environment (Bandura, 1986). Thus, cognitivism defines learning as a process in which the learner uses individual behavior and cognitive skills to interact with the learning environment. Two specific skills that contribute to cognitive processes including metacognition and self-efficacy.

A cognitive skill considered critical to the learning process is metacognition. Metacognition is the act of thinking about the thinking process (Bransford et al., 2000). The model of cognitive monitoring outlined by Flavell (1979) indicates four types of metacognition: knowledge, experiences, goals, and actions (p. 906). When conducting an information search, individuals must employ metacognition, or their knowledge about the thinking process, to find and evaluate the quality of information sources (Bowler, 2010;

Tu et al., 2008), thus indicating a relationship between metacognition and the information search process, an integral component of IL.

Another important component of the learning process to consider as part of intervention design is self-efficacy. Bandura describes self-efficacy as “expectations of personal mastery” (1977, p. 193) related to specific tasks. Self-efficacy can originate from emotion, performance, verbal cues, and vicarious experiences (Bandura, 1977). Consequently, self-efficacy is correlated with actual skill (Bandura, 1986). In learning, a connection exists between self-efficacy and student academic success (Ketelhut, 2007). Thus, improving student self-efficacy can improve student performance outcomes, creating a positive impact on the student learning experience. As the intervention research focuses on students in the classroom, addressing self-efficacy has the potential for positive impact on students’ skills (Bandura, 1986).

In sum, cognitivism focuses on the mental processes that contribute to the learning experience (Ertmer & Newby, 1993). Active information processing, or the way learners process information, is critical to the learning experience with a cognitive perspective (Schunk, 2012). Therefore, cognitivism is relevant to IL because it helps to understand how and why individuals process information. Learning is personal, as the actions, beliefs, thoughts, and values of learners influence the learning process (Schunk, 2012). However, learning does not occur in isolation and utilizes many factors including behavior, cognition, and the environment to process information (Bandura, 1986). Another learning theory that considers learning as an active experience is constructivism.

Constructivism: A Theoretical Framework

Constructivism emerged in the early 20th century when theorists challenged the objective nature of cognitivism (Ertmer & Newby, 1993). It gained popularity in the 1980s (Ertmer & Newby, 1993) as educators began to incorporate constructivist principles into instructional design. This began with educational researcher Jean Piaget, who claimed that knowledge does not represent an independent reality, rather, knowledge is adapted based on the individual (von Glasersfeld, 2005). Varied perspectives on constructivism exist such as simple constructivism, radical constructivism, enactivism, and social constructivism—all with different beliefs on the specific tenets of constructivism (Ernest, 2010). While constructivist perspectives differ, the fundamental principle of constructivism indicates that knowledge, or learning, is the act of making meaning (von Glasersfeld, 2005).

The definition of learning from a constructivist perspective considers learning as an event that occurs when the learner interacts with their environment (Ertmer & Newby, 1993). Rather than the existence of an objective reality, as in cognitivism, learning occurs within an individual's mind and is personal to each learner (von Glasersfeld, 2005). New knowledge builds upon prior experience and existing knowledge, making learning a contextual experience (Ernest, 2010). Thus, for meaningful learning to occur, an individual must interact with both themselves and with the specific learning environment (Ertmer & Newby, 1993). The practices of active and personalized learning can help facilitate meaningful learning within a constructivist environment. The information search process is also an active one that requires individuals to evaluate sources and determine their value in context (Hobbs, 2010; Julien & Barker, 2009; Partnership for 21st Century Learning, 2015).

By nature, humans are active, goal-oriented learners (Bransford et al., 2000). While both cognitivism and constructivism view learning as an active process, constructivism expects active learning to result in the construction of new knowledge and beliefs (Ertmer & Newby, 1993). As constructivism considers all knowledge to be constructed, individuals must actively interact with content, experience, knowledge, and the learning environment for successful knowledge acquisition to occur (Ernest, 2010; Ertmer & Newby, 1993). Digital technology facilitates active learning, as individuals can create their own opportunities for learning (Collins & Halverson, 2010). With constructivism, learning opportunities are "facilitated by involvement in authentic tasks anchored in meaningful contexts" (Ertmer & Newby, 1993, p. 64). Thus, learning needs to be personalized for each individual learner to find meaning (von Glasersfeld, 2005). With IL, individuals often apply their skills within the context of the research process to explore an identified problem (Hobbs, 2010).

Technology facilitates personalized learning through use of online communication tools, social media, and web-based applications (Drexler, 2010). Online learning can provide authentic opportunities for students to connect with others, actively construct knowledge, and share learned information (Drexler, 2010; Harris, 2010). The notion of personalized learning challenges traditional schooling practices based on behaviorist principles (Collins & Halverson, 2010; Tyack & Cuban, 1995). Similarly, ubiquitous information access challenges traditional forms of literacy (Loertscher, 2008; Kellner & Share, 2007) as the digital age has transformed the ways we access, use, and share information (Collins & Halverson, 2010). The next section will describe how the information search process (ISP) model (Kuhlthau, 1990) incorporates cognitivism and constructivism to create a conceptual framework for IL instruction.

The Information Search Process Model: A Conceptual Framework

The ISP model explores information searching from the perspective of the individual (Kuhlthau, 1990). It considers "the affective (feelings), the cognitive (thoughts), and the physical (actions) common to each stage" (Kuhlthau, 1990, p. 366). The ISP model includes six stages: initiation, selection, exploration, formulation, collection, and presentation (Kuhlthau, 1990). The six stages of the ISP model offer learners a systematic approach to finding information, which can be a challenging experience for individuals (Kuhlthau, 1990).

Model of the Information Search Process

	Initiation	Selection	Exploration	Formulation	Collection	Presentation	Assessment
Feelings (Affective)	Uncertainty	Optimism	Confusion Frustration Doubt	Clarity	Sense of direction / Confidence	Satisfaction or Disappointment	Sense of accomplishment
Thoughts (Cognitive)	vague →			focused →	increased	interest	Increased self-awareness
Actions (Physical)	seeking	relevant Exploring	information →	seeking	pertinent Documenting	information	

Figure 3.1 The ISP model (Kuhlthau et al., 2008)

Even in the digital age, the ISP model guides student inquiry so that students search in a deep, meaningful way, rather than simply to complete an assignment (Kuhlthau, Heinström, & Todd, 2008). In a mixed methods study of middle and high school students at New Jersey public schools ($N = 574$), researchers interviewed students at three stages of the information search process and tracked nine different feelings from students. Study findings supported using the ISP model for classroom inquiry, both as a diagnostic tool and a way of "guiding students to deeper knowledge development" (Kuhlthau et al., 2008, p. 13). Furthermore, the researchers emphasized the importance of teachers and librarians as facilitators of deeper learning experiences.

The ISP model relates to constructivism because it views information seeking as an individual act of finding meaning to learn about something through a "complex process of construction" (Kuhlthau et al., 2008, p. 2). Constructing meaning from information is one way to define constructivism, therefore, the ISP model aligns with constructivist principles (Ertmer & Newby, 1993). Additionally, the ISP model relates to cognitivism because it describes information seeking as a process and outlines specific steps for finding and using information (Bandura, 1986; Kuhlthau, 1990). Furthermore, the ISP model utilizes metacognition in the formulation stage, when students must form ideas about information during the search process. The next section will synthesize the existing literature as it relates to the conceptual framework of the ISP model and the theoretical frameworks of cognitivism and constructivism.

Synthesis of Existing Intervention Literature

This literature review discusses the advantages and disadvantages of several options for IL instruction including stand-alone instruction, a discipline-based approach, game-based learning, and gamification. While all options have their merits, the chapter concludes with justification for the chosen intervention.

Stand-Alone Skills Instruction

Students need time to gain background knowledge, explore the research process, and reflect on their learning (Branch, 2003). One way to provide students with additional time is to create a stand-alone course or instructional modules dedicated to IL skills. The literature revealed several instances of stand-alone courses used for IL instruction (Branch, 2003; Mokhtar, Majid, & Foo, 2008) that provided models of how it could be implemented.

Two multiple-methods studies of Canadian junior high students focused on students' information seeking processes during inquiry-based learning activities using a theoretical framework of social constructivism (Branch, 2003). The first study examined the information seeking processes of 12 junior high school students from the Northwest Territories when using CD-ROM encyclopedias. The second study examined the information seeking processes of eighth grade students in Alberta during a large research project. With both studies, students exhibited anxiety when creating bibliographic records, particularly when referencing online sources of information. This finding of bibliographic anxiety supports the results from the needs assessment, as students within the professional context also reported low self-efficacy toward bibliographic reporting. Furthermore, the findings from Branch (2003) indicate a need for students to receive specific instruction toward bibliographic reporting and online research. Teachers and librarians need to provide explicit instruction to students on how to "prepare, facilitate, and evaluate or reflect on information seeking and inquiry experiences" (Branch, 2003, p. 57). Also, the study suggested addressing the affective and cognitive needs of students, referencing Kuhlthau's (1990) ISP model as a guide for designing IL instruction.

To provide explicit IL instruction, researchers designed a stand-alone IL course for 14- and 15-year old students at secondary schools in Singapore with the goal of providing IL skills to students using Gardner's theory of multiple intelligences (Mokhtar et al., 2008). The students who received IL training produced higher quality work than the students in the control group who did not receive IL instruction. The authors thus concluded that teaching IL "cannot be left to chance or spontaneous methods. Instead, it should be researched on, deliberately planned and synergized with appropriate pedagogical approaches to ensure effective learning, retention and applicability amongst students" (Mohktar et al., 2008, p. 101). However, providing explicit IL skills instruction outside of the context of a project conflicts with other findings that indicate the value of a more integrated approach.

A possible alternative is to integrate stand-alone online tutorials within existing courses. Researchers at Florida Gulf Coast University created an online tutorial to help improve students' ability to choose, evaluate, and use sources of information for in-class assignments (McClure, Cooke, & Carlin, 2011). While students complete the tutorial as part of an existing course, the content in the tutorial did not relate to course content. Through citation and text analysis of 60 English Composition students from a larger sample of 250 students, researchers determined that online IL instruction helped increase the number of sources students used (McClure et al., 2011). Though the authors concluded that students who completed the tutorial scored better on their essays, they still recognized the value of face-to-face IL instruction from librarians. Additionally, they concluded that face-to-face instruction was more important as students advance through their education but suggested that online tutorials might be appropriate for introductory-level courses. Thus, online tutorials might be more applicable at the middle school or high school level to teach fundamentals. The next section discusses an alternative to IL instruction through stand-alone courses or units—using a discipline-based approach.

Discipline-Based Approach

Rather than IL instruction as a stand-alone course or unit, IL skills can be taught through a discipline-based approach, integrating IL instruction with existing course content and curriculum. Integration can be face-to-face or delivered electronically as part of a blended or online course. A discipline-based approach connects students with relevant resources (Dotson & Diaz, 2008) and provides opportunities for meaningful discussions regarding IL instruction in context (Jackson, 2007).

One way to integrate IL skill instruction is through an online learning management system. A learning management system is a web-based environment that allows teachers to add course content online (Jackson, 2007). Examples of learning management systems include Blackboard, Moodle, or PowerSchool. Freshmen engineering students at The Ohio State University take an engineering survey course that includes a library research module as part of the course's online learning management system (Dotson & Diaz, 2008). Results indicated evidence that both students and teachers preferred subject-specific IL instruction to an isolated approach. Researchers argued that discipline-specific library instruction allows students "to be exposed to the resources that will give the most relevant results for their literature search and will begin to introduce them to the discourse of their own field" (Dotson & Diaz, 2008, p. 561).

A survey of 171 librarians in the California State University System aimed to discover how librarians collaborated with professors to use learning management systems for IL and library instruction (Jackson, 2007). Researchers concluded that "presenting information literacy content in a way that can easily be integrated into the LMS is critical" (Jackson, 2007, p. 458). Also, when librarians and teachers participated in course discussion boards, then meaningful student discussion and improved IL skill development occurred (Jackson, 2007). Furthermore, study results indicated that librarians rarely collaborated within learning management systems, but when online courses did include IL instruction with librarian integration, an enhancement of student performance and understanding occurred. Thus, the next section will further examine the importance of the librarian in IL instruction, as well as the value of teacher-librarian collaboration for IL instruction.

Teacher-Librarian Collaboration

Librarians can play a pivotal role in discipline-based IL instruction as they "encourage the students to take on the identity of a researcher, to learn the controlled vocabulary of their field and how that vocabulary can be manipulated in order to take control of the database search results" (Becker, 2013, p. 202). Regarding the collaborative aspect of discipline-based IL instruction, Oakland University researchers concluded that the librarian acts as "a pivotal role as the instructional designer" (Greer et al., 2016, p. 297). At Oakland University, librarians must deliver IL instruction through an existing Composition course, though the librarian-delivered content acts as stand-alone sessions separate from the regular course curriculum. Researchers examined the differences in student outcomes between blended courses, which included both face-to-face and online learning opportunities, and completely online courses (Greer et al., 2016). They found that students in the online course performed better on IL skills assessments. However, the researchers suggested that carefully designed learning opportunities contributed to student outcomes rather than the delivery method alone. Thus, creating quality learning opportunities should be a primary focus of IL instruction.

Another example of teacher-librarian collaboration occurred through research at the University of North Texas, where researchers declared collaboration between faculty and librarians as a key component in the success of IL instruction (Anderson & May, 2010). A total of 103 undergraduate students participated in a study on different methods of IL instruction within existing courses. Individuals received a different experiment condition based on the section of Introduction to Communication to which they previously enrolled. Though different methods of instruction (e.g., blended, face-to-face, online) did not seem to influence students' IL skills, course-integrated instruction did benefit students' IL skills development (Anderson & May, 2010).

Collaboration between librarians and teachers may also act as a barrier to implementation of collaborative IL instruction (Dotson & Diaz, 2008; Jackson, 2007). As found in the needs assessment and previous literature reviews, teachers see a lack of time as a barrier to any type of technology integration, including IL and ML education (Ertmer et al., 2012; Shifflet & Weilbacher, 2015). A lack of time for teachers includes a lack of time to collaborate and plan with others. Even so, existing literature recognizes the value of a discipline-based approach with teacher-librarian collaboration (Anderson & May, 2010; Dotson & Diaz, 2008; Greer et al., 2016; Jackson, 2007) indicating a need for schools to create time for such efforts to occur.

Game-Based Learning

Another possible delivery method for IL instruction includes game-based learning, or using gameplay as part of the classroom learning experience. Games not only act as entertainment for players but provide "rich virtual worlds" that make them "powerful contexts for learning" (Shaffer, Squire, Halverson, & Gee, 2005, p. 106).

Well-designed games "incorporate good learning principles" (Gee, 2003, p. 114). Additionally, games provide opportunities for players to learn through actively interacting with their environment, an important tenet of constructivism (Ertmer & Newby, 1993). Additional benefits of games include continuous feedback, increased motivation and positive attitudes, an interactive environment, intrinsic motivation, and low-risk opportunities for practicing skills (Broussard & Oberlin, 2011). Thus, games have the potential to positively impact the student learning experience in a multitude of ways, both in general and specific to IL instruction.

Games and student engagement. Video games can engage students, as today's students prefer technology that is social and entertains them—both of which often appear as video game elements (Markey, Leeder, & Young Rieh, 2012). In a multi-method qualitative study, researchers conducted interviews and observations at 19 different schools (1 nursery, 10 primary, 8 secondary) to explore the impact of console-based video games (e.g., PlayStation, Xbox) on the student learning experience (Groff, Howells, & Cranmer, 2012). The researchers found console-based video games to be successful in engaging and motivating students. Particularly, these positive effects occurred when game use occurred as a hook or inspirational tool.

In a quantitative study of 134 high school physics students and 40 college engineering students playing the computer games *Quantum Spectre* and *Spumone* respectively, researchers used psychometric surveys and structural modeling to investigate the relationship between flow, engagement, immersion, and student learning (Hamari, Shernoff, Rowe, Coller, & Edwards, 2016). Flow is a state of being during gameplay where participants focus all their efforts and skills on the challenge at hand

(McGonigal, 2011). Researchers found that student engagement during gameplay had a positive effect on student learning outcomes. Also, the challenge level of the game predicted student learning outcomes—to which the researchers suggested that game-based learning should include progressively challenging tasks to maintain student engagement throughout the learning experience.

Games and information literacy instruction. Game-based learning provides an opportunity "to transform information literacy instruction" (Smale, 2011, p. 49). Additionally, IL and research skills are often already included as components of gameplay (Smale, 2011). For example, video games often provide information to players at just the right time, when the player needs the information to solve a problem (Becker, 2013). This gameplay concept is like the IL concept of assignment-specific instruction, where lessons "are directly related to the library resources needed to complete a specific task presented to the student" (Becker, 2013, p. 201).

A university library designed the *Goblin Threat* game specifically to teach undergraduate students about the concept of plagiarism in an interactive learning environment (Broussard & Oberlin, 2011). The game was advertised on the library's website and promoted to faculty, with informal survey results indicating positive attitudes towards the game from students. Additionally, librarians at other colleges and universities requested access to the game for use at their own institutions. However, more formal research needs to be conducted on the *Goblin Threat* game to measure desired outcomes. While the research that occurred was informal, Broussard and Oberlin (2011) suggested that game-based learning exhibited potential as one tool in the overall policies and procedures of an institution's comprehensive IL instruction.

In another example, Vrje Universiteit Amsterdam created the game *Saving Asia* to teach students the following IL skills: formulating research questions, identifying and combining keywords, and evaluating the quality of information (van Meegen & Limpens, 2010). First-year undergraduate students (*N* =34), most of them 18-19 years old, self-selected into instructional modules with either a web-based tutorial or the *Saving Asia* game-based learning opportunity. Student performance on a pre- and posttest indicated a learning difference between the two groups for the skill of evaluating the quality of information. The game-based learning group exhibited a gain of 20%, while the web-based tutorial group only exhibited a gain of 12%. Thus, the game-based learning group showed greater improvement in performance, suggesting game-based learning as a promising instructional strategy for teaching specific IL skills. Though they did use the term gamification, researchers also suggested incorporating interactive elements as a possible method for engaging learners and improving student performance—a concept that will be explored in the next section (van Meegen & Limpens, 2010).

Though Hamari et al. (2016) found that challenge level predicted student outcomes in mathematics and science courses, games do not necessarily have to be challenging or difficult to improve student skills. A mixed methods study aimed to determine if simple educational games could improve students' information seeking skills (McCabe & Wise, 2009). Seven sections of a mandatory communications class consisting of first-year college students played online versions of Magnetic Keyword and Tic-Tac-Toe adapted to instruct students on IL skills. Students playing the online games showed more improvement than students in a control group receiving standard IL instruction. Thus, researchers found that online games can be effective in helping students learn how to identify citations and use keywords to search databases.

A multi-modal research study examined the library research skills of college undergraduate students, focusing on how the online game *BiblioBouts* affected students' library research experience. After playing *BiblioBouts*, students exhibited increased confidence in using IL skills and demonstrated a wider range of experience with and knowledge of scholarly sources for research. Increased confidence and performance align with the constructivist principle that positive self-efficacy impacts student learning. The researchers note that when used in conjunction with other forms of IL instruction, game-based learning creates a stronger environment for learning (Markey et al., 2012).

Another study of the *BiblioBouts* game followed 13 classes of undergraduates as they played the game in two courses*: Introduction to Information Studies* and *Video Games and Learning* (Markey, Leeder, & St. Jean, 2011). The researchers used a mixed method approach to determine the impact of game-based learning (*BiblioBouts*) on student behavior when using IL skills. The *BiblioBouts* game helped students realize the benefit of library databases, increased access to relevant sources of information, and provided hands-on practice. Thus, the *BiblioBouts* game supports a constructivist framework as it promotes active learning that involves student construction of IL knowledge and skills (Bandura, 1986; Markey et al., 2011). Furthermore, researchers found that students also gained experience with digital age skills including "collaboration, communication, networking, and peer feedback" (Markey et al., 2011, p. 49). The game also supports a cognitivist framework as students learn from their environment and use existing skills to process information in a complex manner.

Benefits and challenges of game-based learning. Game-based learning provides students opportunities to practice challenging components of IL skills including choosing a topic, using appropriate databases, finding sources, and deciding on their usefulness (Markey et al., 2011). Games also provide opportunities for active learning and knowledge construction, which engages and motivates students (Markey et al., 2011; Markey et al., 2012). Furthermore, games support cognitivism and constructivism because they require mental processing, repeated practice, active engagement with content, and individual learning by experience (Markey et al., 2011; Markey et al., 2012; McCabe & Wise, 2009). Thus, game-based IL instruction appears to be an effective strategy for improving students' IL self-efficacy and skills.

Though the benefits from game-based learning are clear, challenges also exist for implementing game-based learning in the classroom. Games take time for students and teachers to learn. Time is already a precious commodity in the classroom, and the learning curve for mastering a new game means time away from content-based teaching and learning (Smale, 2011). Due to the large time investment that designing or implementing games can require, teachers may be resistant to change their curriculum and incorporate new, unfamiliar practices (Shifflet & Weilbacher, 2015). Along with increased time, games require additional software and support, both pedagogical and technical (Smale, 2011). Gamification may serve as a more practical solution for intervention design.

Gamification

Gamification considers the use of characteristics or design elements from games in nongame contexts (Deterding, Dixon, Khaled, & Nacke, 2011). Another definition considers gamification to be "a process of enhancing services with (motivational) affordances in order to invoke gameful experiences and further behavioral outcomes" (Hamari, Koivisto, & Sarsa, 2014, p. 3026). Instead of gameplay, gamification "brings game elements into an environment (…) which normally wouldn't be a game" (Walsh, 2014, p. 42). Gamification uses "gameful design" (Deterding et al., 2011, p. 13) to enhance an existing activity or task (Becker, 2013). Examples of gamification elements include badges, leaderboards, awarding points, and rewards (Attali & Arieli-Attali, 2015; Walsh, 2014). Gamification provides rich opportunities to collect and access user data (Deterding et al., 2011). This could prove to be useful within the educational context as gamified data on students could be used toward the goal of improving student outcomes.

Gamification and student learning. Digital badges act as visual representations of students' achievements, interests, or skills (Ford et al., 2015). Two models of badges include merit-badges and video-game achievement badges (Abramovich, Schunn, & Higashi, 2013). Merit badges, such as those offered through the United States' Boy and Girl Scouts, provide participants opportunities to earn badges by demonstrating specific knowledge or skill—typically not covered in the traditional classroom curriculum. Video-game achievement badges provide players opportunities to earn and display digital badges based on in-game performance. Educational badges incorporate features from both badging models, including recognition of non-traditional learning of specific knowledge or skills, as well as the ability to display badges on a community or public profile. In a quantitative study of seventh-grade (n = 36) and eighth-grade (n = 15) students at a charter school in a low-income suburb of a city in the eastern United States, researchers examined the relationship between educational badges and student motivation in mathematics when using an intelligent tutoring system (Abramovich et al., 2013). Results indicated that badge acquisition differed depending on learner motivation and prior knowledge. However, researchers concluded that badge earning could have a positive effect on learner motivation. They suggested that when educators or instructional designers choose to use educational badges, that learner ability and motivation should be considered as factors influencing badge design and curricular choices (Abramovich et al., 2013).

A meta-analysis of two separate studies examined the effects of a specific gamification element—points awarded—related to accuracy, performance, and speed on mathematics assessments (Attali & Arieli-Attali, 2015). One study recruited 1,218 adult participants (ages 18-74) from Amazon.com's Mechanical Turk crowdsourcing marketplace and another study used all 693 students from a New Jersey middle school (grades 6-8). Findings revealed no effects on accuracy and an increase of response speed under the points condition. Most middle school students reported that they enjoyed earning points, resulting in a minor effect of the points condition on likeability. The researchers concluded that design features assumed to be positive do not always follow expectations in empirical research studies (Attali & Arieli-Attali, 2015). While results did not indicate a positive or significant impact on participant outcomes, limitations occurred. The studies focused on only one domain and question type, limiting generalizability to other examples of gamification or different subject areas. Thus, the researchers suggested that a combination of gamification components might generate more impact contributing to student performance (Attali & Arieli-Attali, 2015).

A longitudinal study at a large Midwestern university examined student motivation, social comparison, effort, satisfaction, learner empowerment, and academic performance in undergraduate students who voluntarily signed up for different sections of a Communications course (Hanus & Fox, 2015). One section of the course received a gamified curriculum—including badges and a leaderboard—while the other section of the course received the same curriculum without the gamified elements. Of the 80 students enrolled in both sections, 71 students participated in the research study including completion of four surveys. The study revealed that students in the gamified section of the course exhibited lower levels of empowerment, motivation, and satisfaction than students in the nongamified section of the course. While these results suggest a negative impact on students from gamification, the study posed some limitation that may have affected results. First, students were required to earn badges and participate in the gamified elements of the course—mandating participation may have caused the negative reaction in students. Additionally, the course used a traditional classroom delivery format rather than a blended or digital format, which might be more conducive to gamification. Thus, researchers suggest that educators and instructional designers proceed with caution to ensure gamification is integrated carefully into the classroom learning environment (Hanus & Fox, 2015). Additionally, the researchers recognize that additional research in different contexts—such as blended or online learning—and with different gamification elements might provide better insight into the impact of gamification on student learning.

For example, researchers in Taiwan examined the effects of gamification and self-explanation strategies on learning achievement, attitudes, and metacognitive awareness related to learning algebra variables (Sun-Lin & Chiou, 2017). Using a 2 x 2 quasi-experimental method, sixth-grade students (*N* = 97) participated in a four-week program using a digital learning system with nine learning tasks including game-reward and self-explanation strategies. Different student groups experienced both game-reward and self-explanation elements, game-reward without self-explanation, self-explanation without game-reward, and a control group experienced no additional strategies. Based on comparison of student results from pre- and posttest quantitative instruments measuring algebra achievement, attitude, and metacognitive awareness, researchers noted several interactions between variables. First, the student groups experiencing game-reward elements performed significantly better on achievement tests than the groups that did not experience game-reward elements. This finding indicates that receiving points as rewards can motivate students to achieve, even as an extrinsic motivator, when integrated in a noninvasive manner to course curricula (e.g., answering questions, reading new material, self-reflection). Next, the student group that experienced both game-reward and self-explanation strategies reported higher learning attitudes, suggesting that game-reward elements have a positive impact on student learning attitudes. This finding builds upon the research of Attali and Arieli-Attali (2015), who found only minor effects of points on students' accuracy, because the students in Sun-Lin and Chiou's (2017) study could apply their points to gameplay enhancements, thus strengthening the relationship between the reward and student motivation.

Gamification and information literacy instruction. In the spring semester of 2017, Fresno State librarians designed and implemented an escape room, or gamified setting, to teach first-year undergraduate students the basics of library research including how "to find and analyze credible sources in the library" (Pun, 2017, p. 331). The workshop, a singular IL instructional activity, occurred several times over the semester with an average of 15 students per workshop. After the workshop, students participated in an unstructured discussion where they self-reported increased confidence in conducting basic library research and found the game to be “challenging, fun, and enlightening” (Pun, 2017, p. 333). Thus, the researchers recommended that librarians can use gamification to teach basic IL skills such as finding credible sources and fact-checking (Pun, 2017).

The University of Huddersfield in the United Kingdom implemented Lemontree, a gamification platform designed by an external company, with a goal of increasing student engagement and use of library resources (Walsh, 2014). Early in the first academic term of program implementation, 156 of 762 registered users completed a survey related to their use of the platform. Students self-reported increased engagement and library usage after participating in the Lemontree platform. Additional data is needed to make statistically relevant correlations between participation and usage, however, initial results seem promising (Walsh, 2014).

The web-based program InfoSkills2Go includes assessments, games, and tutorials to help students learn IL skills using “a gamified badging system to engage and motivate students” (Laubersheimer et al., 2015, p. 2). A team of librarians worked together to create the program, then tested its efficacy in a pilot study with an English class of high school freshmen (*N* = 27). Students took the Evaluate Sources and Information section of the Tool for Real-time Assessment of Information Literacy Skills (TRAILS; Kent State University Libraries, 2017) as a pre- and posttest before and after participation in the program. After adjusting data to only include results from students who took the task seriously, researchers found a 20.7% learning gain with a 0.36 normalized learning gain (Laubersheimer et al., 2015). This finding suggests that gamification can enhance IL instruction to improve student learning outcomes.

A gamified approach to IL instruction at Portland State University also utilized a discipline-based approach, as faculty and librarians collaborated to design a curriculum and assessment plan for IL instruction within three existing health courses using a digital badging system (Ford et al., 2015). Focusing on lessons learned during the planning process, researchers found that a discipline-based approach helped to "guide instructional design, which takes true collaboration, time and planning" (Ford et al., 2015, p. 41). Additionally, the researchers suggested that badges can act as a tool for improving the student learning experience, but the primary goal of IL instructional design should focus on "improving IL skills integration into disciplinary courses" (Ford et al., 2015, p. 41).

Benefits and challenges of gamification. While gamification is not a new concept, the term is relatively new in the field of education, with first documented use occurring in 2008 and widespread use beginning in 2010 (Dicheva, Dichev, Agre, & Angelova, 2015). As a result, research on gamified education is limited—making it difficult to generalize research findings to the broader educational context. Early research has its limitations and thus exhibits mixed results. The gamification strategy of earning badges can positively impact learner achievement, attitudes, and motivation (Abramovich et al., 2013; Sun-Lin & Chiou, 2017), but may not provide a positive impact if students are forced to participate (Hanus & Fox, 2015). Earning points has a positive impact on student likeability, however, the same strategy might not have an impact on student accuracy or response speed (Attali & Arieli-Attali, 2015). Due to mixed results and limited research on gamified education thus far, additional empirical research must occur to investigate the specific relationships between different game elements, educational contexts, and learners (Dicheva et al., 2015).

Regarding gamified IL instruction specifically, students report gamification for basic IL skills instruction (e.g., fact-checking, finding credible sources) to be "challenging, fun, and enlightening" (Pun, 2017, p. 333). Students also self-reported increased engagement and library usage after participation in gamified library instruction (Walsh, 2014). Furthermore, researchers found increased student learning outcomes with gamified IL instruction (Ford et al., 2015; Laubersheimer et al., 2015). Thus, gamification appears to enhance IL instruction and leads to improved skills.

Justification for Intervention Design

The synthesis of existing literature presented several options for intervention design related to IL instruction: stand-alone courses, a discipline-based approach, teacher-librarian collaboration, game-based learning, and gamification. Existing research suggests that IL instruction needs to combine several elements to provide the greatest impact on student learning outcomes (Attali & Arieli-Attali, 2015; Broussard & Oberlin, 2011). As such, the intervention design incorporates multiple elements including a discipline-based, gamified approach with some level of teacher-librarian collaboration. The researcher designed an intervention that included an "intentional, thoughtful, outcomes-based curriculum design" (Ford et al., 2015, p. 32) toward the long-term goal of increasing student IL skills within the classroom.

While IL instruction can occur in a variety of formats, librarians serve a critical role in IL instruction regardless of delivery method. Thus, librarians must "bring forth their own expertise to instruction, demonstrating initiative and agency in conversations about IL" (Ford et al, 2015, p. 36), but also need to work in collaboration with faculty to create an approach to IL instruction that also works well within existing curriculum. The middle school academic librarian at Harper Valley School is eager to collaborate with middle school faculty, thus making teacher-librarian collaboration an easy component to include within the intervention design.

Stand-alone courses provide explicit IL instruction, which some researchers argue helps students to "prepare, facilitate, and evaluate or reflect on information seeking and inquiry experiences" (Branch, 2003, p. 57). However, stand-alone IL instruction conflicts with the current model at Harper Valley School, which is an integrated approach. Additionally, the existing school schedule does not include opportunities to add additional coursework. Thus, it would be impractical to implement stand-alone IL instruction at Harper Valley School, as it would require a culture shift and major programmatic changes. Thus, stand-alone instruction is not an appropriate method for the intervention design.

Instead, a discipline-based approach is the preferred method for the intervention design, because "domain knowledge cannot be separated from digital literacy" (Rosenzweig, 2017, p. 109). Also, researchers found that both students and teachers preferred an integrated approach over isolated instruction (Dotson & Diaz, 2008). A discipline-based approach aligns with the current model of instruction at Harper Valley School and therefore would not be difficult to implement.

While game-based learning facilitates engaging and transformative learning experiences, most existing IL-specific games target college-level students (Markey et al., 2011; Markey et al., 2012; McCabe & Wise, 2009) and thus would not be appropriate for the target population of eighth-grade students. To use game-based learning as part of the intervention, the researcher would need to develop an entirely new game. Game development is a long and arduous process—impractical for the purposes of this study.

Rather than game-based learning, gamification is a more practical approach for the intervention design. Gamification can act as "one element among a set" (Walsh, 2014, p. 48), occurring within an existing classroom curriculum as part of an integrated approach to IL instruction. Gamification helps to promote self-efficacy because when individuals play games, they have power over their own learning experience (Becker, 2013). Thus, incorporating gamification into the intervention design helps to promote self-efficacy in students, one of the desired outcomes. Furthermore, gamification in IL instruction has been found to increase student engagement (Walsh, 2014) and student learning outcomes (Ford et al., 2015; Laubersheimer et al., 2015).

Overview of Intervention Design

Although a multitude of options exist for IL instruction, a discipline-based and gamified approach seemed most appropriate and practical for addressing the gaps in students' IL self-efficacy and skills within the classroom learning environment. While the literature presented a multitude of IL skills that could use improvement, classroom observations revealed a need to address this particular component of IL instruction. Furthermore, existing research indicates gaps in students' ability to evaluate online information sources (Bowler, 2010; Chung & Neuman, 2007; Metzger et al., 2015; Stanford History Education Group, 2016).

First, students completed a preintervention assessment including the Evaluate Sources and Information subsection of the TRAILS (Kent State University Libraries, 2017; see Appendix F) to measure students' existing skills. Then, students spent four class periods individually completing lessons in Checkology (https://checkology.org), a web-based virtual platform includes gamified and interactive elements to teach students IL and news literacy. Students completed the following lessons: Arguments and Evidence (News Literacy Project, 2019a), Practicing Quality Journalism (News Literacy Project, 2019c), Understanding Bias (News Literacy Project, 2019d), and Misinformation (News Literacy Project, 2019b). While the platform includes a robust curriculum with many lessons, these four lessons best aligned with intervention goals as well as the existing social studies curriculum.

At the end of each class, the teacher and/or librarian facilitated a whole-group discussion about what students learned during that lesson. After completing the modules, students applied their knowledge by conducting research to examine how certain historical figures challenged or maintained the status quo of their time. The research portion of the intervention occurred over three class periods. The following chapter provides a detailed outline of the intervention including research design, methods, and evaluation.

Chapter 4 – Intervention Design and Methodologies

The researcher designed an intervention to address the gaps in eighth-grade students' IL skills at Harper Valley School, an all-girls private school. The intervention included a discipline-based, gamified approach to teaching the specific IL skill of evaluating online information sources, with teacher-librarian collaboration. Though a variety of strategies exist to address IL skills instruction, the chosen intervention design seemed to be the most appropriate for addressing student needs within the professional context. The intervention built upon and supported existing structures within the context through a discipline-based approach that included the librarian as a collaborator. The researcher chose to include Checkology as part of the intervention because it was designed for school-aged children, provided relevant lessons for curricular and dissertation goals, and aligned well with the existing social studies curriculum. Additionally, whole group discussions provided students with opportunities to receive teacher and librarian guidance on the content from Checkology lessons. Finally, students completed an independent research assignment to apply what they learned from the instructional unit. In sum, students participated in the Checkology virtual platform, whole group discussions, and completed an individual, research-based assignment as part of a targeted instructional unit designed by the researcher to best meet the needs of students within the classroom learning environment.

Statement of Purpose

The purpose of the study was to investigate the impact of student participation in a discipline-based, gamified approach to teaching the IL skill of evaluating online information sources. The study tested the hypothesis that students who participated in the designed instructional unit would increase their ability to evaluate online information sources and improve self-efficacy toward IL skills. The research questions for this study addressed both process and outcome evaluation for the intervention. The research questions included:

Process Evaluation Research Questions:

RQ1: To what extent did the implementation of the instructional unit align with the intended research design?

RQ2: What were the level and quality of student participant responsiveness during the intervention?

RQ3: What was the overall experience of study participants with the components of the instructional unit, including the Checkology program, class discussions, and reflection paper?

Outcome Evaluation Research Questions:

RQ4: What is the change in eighth-grade students' ability to evaluate online information sources based on participation in discipline-based IL instruction and a gamified virtual platform?

RQ5: What is the change in eighth-grade students' self-efficacy toward their own IL skills based on participation in the intervention program?

Research Design

The research study was a quasi-experiment with a convergent, fixed-effects, mixed-methods design (Creswell & Plano Clark, 2011; Henry, 2010). A convergent design allowed for quantitative and qualitative data collection to occur independently, with convergence during data analysis (Creswell & Plano Clark, 2011). A fixed-effects design meant that the same individuals, at two separate instances, acted as the control and treatment group instead of using two separate groups of participants (Henry, 2010). A fixed-effects design was used due to constraints within the professional context. Middle school classes must follow the same curriculum; thus, students could not be grouped into control and treatment groups to receive different instruction. The mixed-methods design included quantitative data from classroom observations, Checkology, and the pre- and postintervention assessment (TRAILS; see Appendix F). Qualitative data came from field notes and transcripts of student focus groups.

The outcomes included students' ability to evaluate online information sources within the classroom learning environment and students' IL self-efficacy. The logic model details the processes and outcomes for the intervention (see Appendix G) and aligns with the theory of treatment (see Appendix H). The following sections describe the process evaluation and outcome evaluation indicators for the intervention.

Process Evaluation

Process evaluation encompasses a multitude of components. For example, to conduct process evaluation of program implementation, several components must be considered together including reach, dose, and fidelity (Linnan & Steckler, 2002). While typical process evaluation methods might calculate a composite score to determine program implementation (Linnan & Steckler, 2002), this study took a more holistic approach and considered all data for the combined components.

Fidelity of implementation considers the "extent to which the intervention was delivered as planned" (Linnan & Steckler, 2002, p. 12). Thus, high fidelity of implementation occurs if the instructional unit is delivered as planned. Indicators of fidelity of implementation include adherence to intervention design, dose delivered and received, and participant responsiveness (Dusenbury, Brannigan, Falco, & Hansen, 2003; Saunders, Evans, & Joshi, 2005).

Indicators of adherence to intervention design. Adherence considers the consistency between intervention implementation and design (Dusenbury et al., 2003). The indicator for adherence included an activities time log as a component of field notes during classroom observations (see Appendix I).

Indicators of dose. Dose considers the amount of intended intervention components that are delivered and received (Dusenbury et al., 2003; Saunders et al., 2005). Dose delivered considers the "completeness" (Saunders et al., 2005, p. 139) of the delivered intervention. Dose received can be viewed as two separate components: exposure, or participation, and satisfaction, or participant experience (Saunders et al., 2005). The researcher examined dose delivered and dose received—satisfaction.

The definition of dose delivered considers the "intended units of each intervention or component delivered or provided" (Saunders et al., 2005, p. 139). Thus, the indicator for dose delivered included the activities time log as a component of field notes during classroom observations (see Appendix I). The activities time log provided a list of possible categories for classroom activities based on designed components of the intervention, including a section entitled 'other' to allow consideration of the unexpected.

Dose received—satisfaction considers "participant (primary and secondary) satisfaction with the program" (Saunders et al., 2005, p. 139). Thus, the researcher considered satisfaction as it related to student participants' experience with the intervention. Indicators for satisfaction included field notes from classroom observations and participant responses during student focus groups.

Indicators of participant responsiveness. Participant responsiveness, an aspect of measuring fidelity of implementation, considers the level of engagement and involvement in the intervention by program participants (Dusenbury et al., 2003). For the intervention, participant responsiveness included active engagement with the intervention components—not only attending class, but also participation in the Checkology lessons, class discussions, and subsequent application of knowledge during research. For example, class Checkology reports included the number of lessons completed for each student as well as individual badges and total points earned. Also, students were required to submit annotations for independently chosen sources.

Outcome Evaluation

Two short-term outcomes were measured: students' ability to evaluate online information sources within the classroom environment and students' IL self-efficacy. Quantitative data included student scores on the TRAILS (Kent State University Libraries, 2017) instruments. Qualitative data included field notes from classroom observations and transcripts of student focus groups.

Methods

This section includes a description of participants, process and outcome evaluation instruments, and other materials.

Participants

Nonrandom assignment of study participants occurred (Shadish, Cook, & Campbell, 2002). The study sample aimed to include all eighth-grade students ($N = 92$), both eighth-grade social studies teachers ($N = 2$), and the middle school academic librarian at Harper Valley School in fall of 2018. Of the target population, the researcher obtained parent permission and student assent for 29 students, for a participation rate of 31.5%. All participating students completed the TRAILS before the intervention but only 24 students completed the TRAILS after the intervention, making the final total participation rate 26%. Harper Valley School contains all female students, with 15% students of color. The final participating sample ($N = 24$) included 12.5% students of color ($n = 3$) with an average self-reported age of 13.5 years.

Both teachers and the librarian identified as female. All three held master's degrees. One teacher has been working at Harper Valley School for seven years, while the other teacher, also the middle school social studies department chair, has been at the school for 10 years. The librarian has been at the school for 13 years.

Instruments and Materials

Instruments included both quantitative and qualitative data sources. The researcher used five instruments to measure process evaluation and four instruments to measure outcome evaluation, including student ability and self-efficacy. Additional instructional materials included the Checkology virtual platform and a grade-level LibGuide for basic research projects.

Process evaluation instruments. Process evaluation instruments included attendance records, student participation data from Checkology, and information from classroom observations.

Attendance records. The researcher collected attendance data for each eighth-grade social studies class that occurred during the intervention using an attendance sheet (see Appendix J). The attendance sheet included a section for notes, which provided the researcher an opportunity to indicate abnormalities in attendance—for example, if students were present but off-task. Thus, attendance records measured the dose received in a quantitative manner.

Checkology class reports. Checkology tracks individual student progress, including lessons completed and points earned. Student progress can also be downloaded as a spreadsheet by class section. Student participation data from the Checkology platform (see Appendix K) measured the dose received, specifically the quantitative level of participation for each student (exposure) during the instructional unit.

Classroom observations. The researcher conducted classroom observations for all class sections during intervention implementation. Classroom observations included qualitative field notes as a participant observer, with a focus on the student learning experience (Schutt, 2015). Observations included a quantitative classroom activities time log (see Appendix I). The classroom activities time log measured adherence and dose delivered, and qualitative field notes measured participant responsiveness and dose received—satisfaction.

Student focus groups. One component of student focus groups included evaluation of participant responsiveness and dose received—satisfaction. Semi-structured interviews occurred within two focus groups of three students, with one student included from each class section (see Appendix L). Several questions asked students about their experience with the intervention components, including the Checkology platform, whole group discussions, and research project. For example, one question stated: "What was your experience with the Checkology virtual platform?" and another asked “Did you find the core lessons helpful? In what ways?”. This qualitative data measured participant responsiveness and dose received—satisfaction.

Student work. A component of the intervention involved students writing a research paper on an individual in history who challenged or upheld the status quo of their time. Students were required to annotate the sources they chose independently to explain why they chose that particular source. This assignment was chosen based on consultation with the middle school librarian and the social studies teachers and was intended to connect the content from Checkology lessons with the social studies curriculum. Student participants were required to submit annotations for independently chosen sources to their classroom teacher, librarian, and the researcher.

Outcome evaluation instruments. Outcome evaluation instruments included both quantitative and qualitative data sources. Quantitative data sources included student scores on the TRAILS (Kent State University Libraries, 2017). Qualitative data sources included field notes from classroom observations and student focus groups.

Tool for Real-time Assessment of Information Literacy Skills. The researcher used the 10-item sub-category of Evaluate Sources and Information from the ninth-grade TRAILS as part of a student pre- and postintervention assessment (see Appendix F). Student results on TRAILS measured the proximal outcome of students’ ability to evaluate online information sources. As the instructional unit occurred over a limited period, the impact on students’ abilities may be minimal.

Classroom observations. The researcher conducted classroom observations for all class sections during intervention implementation. Classroom observations included field notes, conducted as a participant observer with a focus on the student learning experience (Schutt, 2015). Field notes from classroom observations measured both proximal outcomes of students' ability to evaluate online information sources within the classroom environment and students' IL self-efficacy.

Student focus groups. Student focus groups included questions that focused on the proximal outcomes of student ability and self-efficacy. Semi-structured interviews occurred within two focus groups, with one student included from each class section (see Appendix L). The researcher asked students questions about the changes in their ability to evaluate online sources, the intervention components, and about the changes in IL self-efficacy. Data from student focus groups measured both proximal outcomes.

Student work. A component of the intervention involved students writing a research paper on an individual in history who challenged or upheld the status quo of their time. Students were required to annotate the sources they chose independently to explain why they chose that particular source. This assignment was chosen based on consultation with the middle school librarian and the social studies teachers and was intended to connect the content from Checkology lessons with the social studies curriculum. Student participants were required to submit annotations for independently chosen sources to their classroom teacher, librarian, and the researcher.

Materials. Instructional materials included the Checkology virtual platform and a grade-level LibGuide for basic research projects. The instructional unit included the following Checkology lessons: Arguments and Evidence (News Literacy Project, 2019a), Practicing Quality Journalism (News Literacy Project, 2019c), Understanding Bias (News Literacy Project, 2019d), and Misinformation (News Literacy Project, 201b). The Arguments and Evidence lesson helps students to think about the difference between arguments based on evidence versus those based on opinion. An editorial writer for the *Wall Street Journal* walks lesson participants through a fictional scenario related to social media use. She introduces vocabulary related to logical fallacies: ad hominem, false equivalence, slippery slope, false dilemma, and the straw man argument. Lesson activities include open-response questions, matching vocabulary, and identifying different types of logical fallacies in simulated social media posts. The Practicing Quality Journalism lesson teaches students about standards in journalism and how they can help consumers to identify the difference between false, misleading, and quality information. Students were presented with a fictional breaking news story and took on the role of a newspaper reporter investigating the incident. The Understanding Bias lesson helps students to think about bias in its many forms. Lesson activities include viewing different sources of information on the same topic and then decide the level of bias in each source and analyzing photos for confirmation bias. Additionally, the Op-Ed editor for *The New York Times* teaches students to identify the level of judgement, tone, balance, and fairness in information sources to determine potential bias. The Misinformation lesson explores different types of misinformation, why it matters, and how to address misinformation. Students learn about different misinformation types—fabricated content, manipulated content, imposter content, false context, and satire—through engaging videos. Lesson activities include matching information sources to misinformation types and open-ended questions about scenarios related to misinformation. In all four Checkology lessons, students have the opportunity to earn points by completing lesson activities. Students can also gain additional points by earning badges for completing tasks or mastering specific skills.

During the research portion of the project, students received access to a grade-level LibGuide—an electronic library guide—for basic research projects with links to school-subscribed databases (e.g., Britannica, Student Resources in Context) and other general information sources. However, students were required to choose at least one source on their own, not included on the LibGuide, to demonstrate application of their knowledge on how to evaluate online information sources. Students used NoodleTools, an online platform, as a citation management tool.

Procedure

This section provides a description of the research study procedures, including participant recruitment and the implementation timeline. It also includes descriptions of data collection, management, and analysis. Finally, the section concludes with summary matrices for a visual representation of data collection and analysis methods.

Participant Recruitment

All eighth-grade students and both eighth-grade social studies teachers at Harper Valley School were asked to participate in the study. To recruit student participants, the researcher first obtained parental consent. All eighth-grade parents received access to an electronic consent form through Veracross (see Appendix M). Parents were asked to agree or disagree to allow their child to participate in the research study. Parents received several follow-up email(s) as a reminder to complete the consent form (see Appendix N). After several weeks of parent recruitment, student participants were recruited within social studies classes. The researcher described the study, its purpose, and explained that participation in the research study was completely voluntary (see Appendix O). Students then received a link to an electronic assent form (see Appendix P) which was included as the first page of the student preintervention assessment. At the request of the social studies teachers, all students participated in the instructional unit. Therefore, consent/assent determined if student data would be included in the research study.

One student from each class section was randomly selected to participate in a student focus group. Students selected to participate in the student focus groups were contacted by the researcher via email following completion of the instructional unit (see Appendix Q). All students who were selected agreed to participate in the focus group and the researcher coordinated a 30-minute time-period with the Dean of Students and individual student participants to find a time that worked for everyone.

The two social studies teachers and the middle school academic librarian received an email before the start of the school year that described the research project and requested their participation in the study (see Appendix R). The email also included a link to an electronic consent form (see Appendix S).

Intervention

The planned intervention included student participation in the following Checkology lessons: Arguments and Evidence (News Literacy Project, 2019a), Practicing Quality Journalism (News Literacy Project, 2019c), and Understanding Bias (News Literacy Project, 2019d); whole group discussions after each class; and an individual, research paper to apply learned concepts. The instructional unit took seven, 50-minute class sessions and occurred during regularly scheduled social studies classes.

Preintervention activities. All recruitment occurred before the intervention was implemented. Also, before the instructional unit, participating students completed a 10-

item assessment, the ninth-grade Evaluate Sources and Information subsection of the TRAILS (Kent State University Libraries, 2017; see Appendix F).

Session 1. In October, social studies teachers implemented the instructional unit as part of their classroom curriculum. The first 50-minute class session involved students registering for the Checkology platform via a link shared by the teacher in a class email. Then, the researcher briefly introduced how to navigate the platform, explained its purpose, and established guidelines for participation. Following the introduction, students started to work through the prescribed Checkology lessons. The last several minutes of class included a whole group, teacher-led discussion about what students learned during the session.

Sessions 2-4. The second, third, and fourth 50-minute class sessions involved students working through the prescribed Checkology lessons (News Literacy Project, 2019a, 2019c, 2019d). Similar to the first session, students worked individually at their own pace, and the last few minutes of each class included a whole group, teacher-led discussion. In some classes, the researcher had to lead the whole-group discussion as there was a substitute teacher. In some classes, the librarian also helped facilitate discussion. Students completed the planned lessons in the first three sessions. Therefore, the researcher and teachers decided to include an additional Checkology lesson, Misinformation (News Literacy Project, 2019b), for students to complete during session four. Alternatively, in one class section students participated in a student-led, whole group Harkness-style discussion (Trustees of Phillips Exeter Academy, 2019).

Sessions 5-7. The fifth, sixth, and seventh 50-minute class sessions involved students completing a research assignment where they examined how certain historical figures challenged or maintained the status quo of their time. Students were asked to use at least one source from the grade-level LibGuide, but also to find one additional online source on their own. Students used NoodleTools as a citation management and research organization tool. NoodleTools is a web-based platform that allows users to cite sources, take notes, create outlines, and share work with teachers. Students worked individually and submitted a final product to their social studies teacher. The librarian was in attendance and provided support during all class sessions that involved research.

Postintervention activities. Immediately following the instructional unit, students were required to turn in their research assignment to their social studies teacher. Additionally, students shared their NoodleTools research (e.g., annotations, citations) with their social studies teacher, the librarian, and the researcher if they were study participants. Student study participants also completed a 10-item assessment, the ninth-grade Evaluate Sources and Information subsection of the TRAILS (Kent State University Libraries, 2017; see Appendix F). Additionally, the researcher conducted two student focus groups with three students each, including one student from each social studies class section.

Data Collection

Data collection occurred throughout the intervention and included data sources for answering both process and outcome evaluation research questions. The data collection model followed a convergent design (Creswell & Plano Clark, 2011). As such, quantitative and qualitative data collection occurred independently, but converged during data analysis (Creswell & Plano Clark, 2011). Data collection included quantitative data from classroom observations (see Appendix I, see Appendix J), Checkology class reports (see Appendix K), and pre- and postintervention student assessments. Qualitative data collection included field notes during classroom observations and electronic transcripts of student focus groups.

Process evaluation. To conduct process evaluation of the intervention, data collection occurred using multiple sources. To measure adherence and dose delivered, the researcher collected an activities time log (see Appendix I) as part of classroom observations. For participant responsiveness, three quantitative measures were used. During each class session, the researcher recorded attendance using an attendance sheet (see Appendix J). Also, after the instructional unit, the researcher collected student participation data from the Checkology platform.

Participant responsiveness considered how students engaged with the different components of the instructional unit. A quantitative definition of participant responsiveness considers the student completion rate of Checkology lessons. However, participant responsiveness was also a qualitative component of process evaluation. Thus, participant responsiveness also considered the student experience through classroom observations and participant responses during student focus groups. An additional component of process evaluation included dose received—satisfaction. During classroom observations, the researcher recorded qualitative field notes on a laptop to measure both participant responsiveness and dose received—satisfaction.

Outcome evaluation. To conduct the outcome evaluation of the intervention, data collection occurred using multiple sources. As a quantitative resource, students completed the Evaluate Sources and Information subsection of the ninth-grade TRAILS (Kent State University Libraries, 2017; see Appendix F) as a pre- and postintervention assessment via an online link to Qualtrics. Other quantitative data included classroom observations and Checkology class reports (see Appendix K). The researcher also collected qualitative data to gain additional insight into outcome evaluation. Qualitative data sources included field notes from classroom observations, student focus groups, and student work. During classroom observations, the researcher recorded anecdotal field notes electronically and acted as a participant observer, allowing for the ability interact with participants during the observations (Schutt, 2015). Additionally, the researcher recorded the audio of the student focus groups and transcribed the audio files for analysis purposes. Finally, the researcher collected student work; mainly Checkology data and source annotations from NoodleTools.

Data Management

Parental consent forms were created, administered, and stored using a password-protected account on Veracross, the school's student information system. Faculty and student consent forms, along with student assessments, were created, administered, and stored using a password-protected Qualtrics account. All faculty and students at Harper Valley School receive a school-issued laptop and used these for participation in research.

Student focus groups were recorded using the researcher's school-issued laptop and an external USB microphone. During the data collection process, the researcher's laptop was stored in a locked office within the school library. All electronic files (e.g., audio recordings, documents) related to the research study were collected and then stored in a password-protected Dropbox account.

All participating students were assigned a confidential participant number. For all student data collected during the study, students' names were removed from data sources and replaced with the confidential participant number. Individual students were not identified in the pre- and postintervention assessment, rather, data was analyzed in aggregate form. Teacher and librarian names were also removed from data sources and replaced with a pseudonym.

Data Analysis

This section outlines the statistical tests that were used for quantitative analysis and the coding procedures that were used for qualitative data analysis as shown in the summary matrices (see Tables 4.1 & 4.2). The research questions guided all data analysis. Each research question was addressed during data analysis.

Quantitative data. To explore RQ1 (To what extent did the implementation of the instructional unit align with the intended research design?) the researcher used descriptive statistics to analyze classroom activities logs (see Appendix I). To explore RQ2 (What were the level and quality of student participant responsiveness during the intervention?), the researcher used descriptive statistics to analyze attendance sheets (see Appendix J) and activities logs from classroom observations (see Appendix I). This included the attendance of each student and the aggregate class attendance, a record of activity type (e.g., procedural, Checkology, whole-group discussion), and a numerical time log for each class (e.g., Class A spent 10-minutes off-task, 30-minutes in Checkology, 10-minutes in whole-group discussion). The researcher also analyzed participation levels from the students who turned in annotated sources.

To explore RQ4 (What is the change in eighth-grade students' ability to evaluate online information sources based on participation in discipline-based IL instruction and a gamified virtual platform?), the researcher used descriptive statistics to analyze student results on the TRAILS. Data was cleaned and analyzed using the web-based program Qualtrics. Descriptive statistics included calculating the mean, median, mode, and standard deviation for both individual questions and the total score. Additionally, the researcher conducted a paired t-test to compare pre- and postintervention assessment results. To protect student data, the researcher analyzed student scores as an aggregate.

Qualitative data. Qualitative data was used to explore RQ3 (What was the overall experience of study participants with the components of the instructional unit, including the Checkology program, class discussions, and reflection paper?), RQ4 (What is the change in eighth-grade students' ability to evaluate online information sources based on participation in discipline-based IL instruction and a gamified virtual platform?), and RQ5 (What is the change in eighth-grade students' self-efficacy toward their own IL skills based on participation in the intervention program?). For qualitative data collected from classroom observations and student focus groups, the researcher cleaned documents and conducted an initial read-through. The researcher then used NVivo software to conduct inductive thematic coding of field notes from observations and focus group transcripts (Saldaña, 2016). The researcher read through codes again and grouped them based on emergent themes related to research questions. Finally, using deductive reasoning, results from qualitative data analysis were merged with results from quantitative data analysis, where appropriate, to present a comprehensive analysis of the intervention during discussion. The researcher also examined students' annotations for evidence of skill development.

Summary matrices. Summary matrices (see Tables 4.1 & 4.2) describe the connection between research questions, variables, instrumentation, data collection, and data analysis.

Table 4.1

Process Evaluation Summary Matrix

RQ	Variable	Instrumentation	Data Source(s)	Data Collection Frequency	Data Analysis
RQ1	Adherence; Dose delivered	Activities time log (see Appendix I)	Researcher	Each class session	Descriptive statistics
RQ2	Participant responsiveness	Attendance sheets (see Appendix J)	Researcher	Each class session	Descriptive statistics
RQ2	Participant responsiveness	Checkology reports (see Appendix K)	Students; Teachers	After instruction	Descriptive statistics
RQ2	Participant responsiveness	Source annotations in NoodleTools	Students	After instruction	Descriptive statistics
RQ3	Dose received–satisfaction	Field notes	Researcher	Each class session	Inductive thematic coding
RQ3	Dose received–satisfaction	Student focus groups (see Appendix L)	Focus group participants	Postintervention (two focus groups)	Inductive thematic coding

Table 4.2

Outcome Evaluation Summary Matrix

RQ	Variable	Instrumentation	Data Source(s)	Data Collection Frequency	Data Analysis
RQ4	Student ability	TRAILS (see Appendix F)	Student participants	Pre- and postintervention	Descriptive statistics; paired t-test
RQ4	Student ability	Field notes	Researcher	Each class session	Inductive thematic coding
RQ4	Student ability	Student focus groups (see Appendix L)	Focus group participants	Postintervention (two focus groups)	Inductive thematic coding
RQ4	Student ability	Source annotations in NoodleTools	Students	After instruction	Researcher analysis
RQ5	Student self-efficacy	Field notes	Researcher	Each class session	Inductive thematic coding
RQ5	Student self-efficacy	Student focus groups (see Appendix L)	Focus group participants	Postintervention (two focus groups)	Inductive thematic coding

Chapter 5 – Findings and Discussion

The purpose of this chapter is to discuss the findings of a discipline-based, gamified approach to teaching the IL skill of evaluating online information sources to eighth-grade students. The intervention occurred during October of 2018 in students' social studies classes. Research questions included both process and outcome evaluation, which will frame the findings and discussion sections below. Then, the chapter will examine limitations and discuss implications for research and practice. Finally, the chapter conclusion will outline recommendations and next steps for research.

The researcher used a mixed-methods, convergent design to collect and analyze both quantitative and qualitative data with the goal of addressing all research questions. The research questions included:

Process Evaluation Research Questions:

RQ1: To what extent did the implementation of the instructional unit align with the intended research design?

RQ2: What were the level and quality of student participant responsiveness during the intervention?

RQ3: What was the overall experience of study participants with the components of the instructional unit, including the Checkology program, class discussions, and reflection paper?

Outcome Evaluation Research Questions:

RQ4: What is the change in eighth-grade students' ability to evaluate online information sources based on participation in discipline-based IL instruction and a gamified virtual platform?

RQ5: What is the change in eighth-grade students' self-efficacy toward their own IL skills based on participation in the intervention program?

Process Evaluation

Alignment of Design and Implementation (RQ1)

To answer RQ1 (To what extent did the implementation of the instructional unit align with the intended research design?), the researcher analyzed classroom activities time logs. RQ1 focused on adherence, or consistency of intervention implementation (Dusenbury et al., 2003) and dose delivered, or the "completeness" (Saunders et al., 2005, p. 139) of the intervention implementation.

The logs included a brief description of the activity type and a numerical time log, rounded to the minute (see Table 5.1). The designed instructional unit included seven, 50-minute classes. The average length of each class was 46 minutes, or 93% of the planned time for instruction. Accounting for the fact that the school does not provide students with transition time between classes, successful adherence, or consistency, to the planned intervention occurred.

Table 5.1

Summary of Classroom Activities Time Log

Activity	A	B	C	D	E	F	Average
Procedural	15	20	10	13	10	10	13
Instructional—General	45	35	35	45	40	35	39
Instructional—Independent work	220	200	235	208	225	225	219
Instructional—Whole group (e.g., demo, discussion)	50	85	40	59	42	45	54
Total instructional time	330	340	320	325	317	315	325

Regarding dose delivered—the researcher only planned for students to complete three Checkology lessons: Arguments and Evidence (News Literacy Project, 2019a), Practicing Quality Journalism (News Literacy Project, 2019c), and Understanding Bias (News Literacy Project, 2019d). However, as previously stated, an additional Checkology lesson, Misinformation (News Literacy Project, 201b), was added during the implementation, with one class section conducting a Harkness-style discussion (Trustees of Phillips Exeter Academy, 2019) instead of the additional lesson. The Misinformation lesson and student-led discussion were added at the discretion of the social studies teachers upon consultation with the researcher, due to students completing the planned instructional unit in less time than expected. Therefore, the dose delivered was complete, but also required additional activities during implementation.

Student Participant - Responsiveness (RQ2)

To answer RQ2 (What were the level and quality of student participant responsiveness during the intervention?), the researcher analyzed attendance sheets, Checkology class reports (see Appendix K), field notes from classroom observations, and transcripts from student focus groups. Quality participation considers the extent to which participants engage with intervention components—Checkology, class discussions, and the research assignment. The data analysis for RQ2 focused mostly on quantitative data related to participation, while the data analysis for RQ3 focused on qualitative data.

Students were on-task during the lessons and there were only a few absences. One student (D3) was absent during administration of the preintervention assessment, which she completed at a later date on her own time. One student (E3) was absent during session one, the first day of the instructional unit. This meant the researcher had to spend a few minutes at the beginning of session two helping the student log in to Checkology. Also, E3 earned less badges (50% compared to 70% overall) and points (72.5% compared to 92.4% overall). Finally, one student (D2) was absent during session seven, the last day for library research and the instructional unit.

The Checkology program tracks individual student progress, including lessons completed, badges earned, and points earned. The researcher downloaded this information as a spreadsheet following the conclusion of the intervention (see Appendix K). Checkology data provided information on the level of exposure for student participants, or the dose received. Completion rates were calculated first by class section, then averaged together. This was due to the variance in the class section that completed a

Harkness-style discussion (Trustees of Phillips Exeter Academy, 2019) instead of the fourth Checkology lesson, so their potential totals differed from the other class sections.

Overall, students had a 78% lesson completion rate, earned 70% of possible badges, and were awarded 93% of possible points (see Appendix K). The lesson completion rate could potentially be higher than the class reports indicated. Program lessons are considered complete when the submit button is clicked on the last page of the lesson. Some students may not have hit the submit button after completing the lesson content. Field notes from classroom observations indicated that only 18 of 24 students contributed to classroom discussions, or 67% of participants. This level of participation indicates a slightly lower level of student engagement during class discussions. Only two students did not submit their annotated sources, leading to a 92% student participation rate in the annotation portion of the research assignment. The researcher did not receive access to students' final research papers.

Student Participant - Overall Experience (RQ3)

To answer RQ3 (What was the overall experience of study participants with the components of the instructional unit, including the Checkology program, class discussions, and reflection paper?), the researcher analyzed field notes from classroom observations and transcripts of student focus groups. Using an inductive thematic coding approach (Saldaña, 2016), data was organized by participants' experiences with specific intervention components including the Checkology program, its gamification elements, classroom connections, and teacher-librarian collaboration.

Checkology. Students expressed mixed reactions to the specific lessons within the Checkology program, but the overall student experience was positive. During the instructional unit, when classes found out they were doing another day of Checkology lessons, many students expressed excitement and positive comments. During a focus group, one student (F5) even expressed her desire to do the lessons again to see what she learned, because "it was really fun, I really enjoyed it". Furthermore, students in the focus group remarked that Checkology helped them to be more aware of bias, both in sources during research and also in their personal lives.

The main feature that students liked about Checkology was its interactivity. One student (A3) said the interactive lessons helped pique her interest, while another (A2) claimed it helped her to remember content. Several students expressed liking the format of going back and forth between a video and a related activity. A group of students compared Checkology to EdPuzzle, a website that allows teachers to embed formative assessments within existing videos.

Students also expressed some criticisms of program elements. With one lesson in particular, Arguments and Evidence (News Literacy Project, 2019a), students reported that the "instructions were confusing" (C8) and that they "didn't like matching, it was confusing" (C1). Particularly, students struggled with an activity that taught different types of logical fallacies used in arguments (e.g., ad hominem, straw man). Some students reported attempting this activity multiple times. During the focus groups, students explained that the most difficult part was remembering the specific vocabulary terms they had just learned, but that they were able to apply the general concepts during their research assignment. Additional negative comments included topics that were not relatable, and students hesitant to answer writing prompts because they did not want to put their own biases online.

Discipline-based approach. The intervention occurred during students' regular social studies classes. Social studies teachers included the instructional unit as part of their planned classroom curriculum. The researcher worked with teachers to ensure the intervention aligned with existing curricular goals, as well as addressed the target skills outlined in the problem of practice. The research assignment portion of the instructional unit was intended to foster a discipline-based approach as it provided students an opportunity to apply skills learned during the first part of the instructional unit (the Checkology lessons and whole-group discussions).

Students were clearly able to make connections between the concepts they learned on Checkology and their research assignment, evident in their responses during class discussions and focus groups. In a focus group, one student (C1) said "when I was trying to find a reliable source from Google, I was thinking – I was keeping names in mind like .gov or .edu so that I knew that I was on the right track". The other two students in the focus group agreed. F5 looked for websites from foundations or museums because "then I knew it would be well-researched and dedicated to that person, so there would probably be more information that was reliable about them". D2 said she evaluated sources based on whether or not the information matched up with other reliable sources, such as Britannica Encyclopedia or Student Resources in Context.

Students were also able to make connections to other classes and subjects. Earlier in the fall semester, students read *To Kill a Mockingbird* in English class. As such, students in several classes made connections between the concept of bias in information and the issues covered in the novel. Students also connected Checkology lesson content to seventh-grade history class, when students participated in debates about certain topics relevant during the American Revolution and founding of the United States. About the debates, one student said the Checkology lessons made her think "about what I said that was opinion and not fact". In one class section, a whole-group discussion topic focused on the seventh-grade debates and the importance of presentation in conveying information.

Gamification. All of the students in the focus group acknowledged that they noticed earning points during Checkology lessons, but most did not indicate this as a motivational factor. One student (D2) remarked that she "noticed but I didn't think much about it because I thought more – it's helping me learn more than it's giving me a grade". On the other hand, a student (F5) commented that she noticed the points, but ignored them because "this is just the research, not a grade". So, one student ignored the points because they wanted to focus on the learning experience, while another ignored them because they were not going to contribute to her class grade. Only one student in the focus groups (C1) said she noticed the points and was motivated by them, but explained this as due to her "really competitive" nature.

There was some discussion during a focus group of losing tries during lesson activities as a motivational factor. According to the students, the threat of running out of attempts encouraged them to remember lesson content. One student (B8) said that she noticed other students "going back and re-watching the video and then going back forward and then answering the question" for a greater chance at getting the right answer.

Teacher-librarian collaboration. Field notes provided evidence of teacher-librarian collaboration impacting the student experience. The librarian attended most of the first four sessions, when students completed Checkology lessons and whole-group discussions. Additionally, the librarian completed the same lessons that the students did within the Checkology program to better understand the student experience. As such, the librarian participated in whole-group discussions by asking students' questions and adding her own opinion of the program. For example, the librarian advised students that "this (IL) isn't something you instantly learn". She also reassured students when they felt confused by a challenging activity, saying that application of concepts was more important than memorizing specific vocabulary terms.

For the application portion of the intervention, the librarian was instrumental in facilitating the student experience. As the classroom activities time logs revealed, the librarian spent a great deal of time at the beginning of the research assignment instructing students on topics such as accessing databases and websites, creating annotations and citations, organizing research, and using the grade-level LibGuide. The librarian also acted as a resource during independent research time, answering students' questions and providing additional guidance as needed. For example, the librarian led students through a discussion on the difference between a database and a website. In one of the focus groups, students gave a strong positive response when asked if the librarian was helpful during research projects. The same students also mentioned they were somewhat familiar with evaluating websites for research, as they had done so in previous research projects that involved the librarian.

Outcome Evaluation

Changes in Students' Skills (RQ4)

To answer RQ4 (What is the change in eighth-grade students' ability to evaluate online information sources based on participation?), the researcher conducted both quantitative and qualitative data analysis. Quantitative data analysis included descriptive statistics and a paired-samples t-test for the results from the student pre- and postintervention assessment. Qualitative data analysis included inductive thematic coding of field notes from classroom observations and transcripts of student focus groups.

A paired-samples t-test was conducted to compare student scores on the pre- and postintervention assessment. There was a significant difference in the total scores on the preintervention TRAILS ($M=6.92$, $SD=1.56$) and postintervention TRAILS ($M=7.79$, $SD=1.06$) conditions; $t(23)=-3.49$, $p = 0.002$. This suggests that the intervention had a positive impact on student skills.

During the student-led discussion, students spent time talking about bias—defining and identifying bias, and also recognizing when it is important. Students were able to make a distinction between bias, or opinion, and facts. A few students used the phrase “truth-based” to define facts, while considering bias to be emotion-based. However, one student (B1) suggested that the difference is not always clear because “facts can be used to create bias”. Several students also acknowledged the difficulty in identifying bias when looking for information. One student (B3) noted that “in Checkology (…) it was hard to not lean on one side and be biased”. Another student (B5) claimed that the Internet makes it “hard to tell if things are biased because there’s an information overload”. Even though recognizing bias in sources can be difficult, students noted the importance of developing the skill, because it helps “make opinions based on evidence, not just what people are saying” (B6).

Both student focus groups also discussed bias, expressing that since participating in the Checkology lessons, they had either caught themselves being biased or recognized it in the news or another online source. One student (C1) said that before Checkology, she "never would have thought about the tweets (…) that they could be biased". This same student also said she felt that she "had a good understanding of what was reliable and what wasn't" before the intervention, but that now she has "a better understanding because I know what to look out for". During the independent research portion of the intervention, students seemed to be more critical of online information sources. Several students mentioned Checkology during their research. Also, the researcher observed activities such as students comparing information on unknown sites to information from reliable sources (e.g., Britannica, Student Resources in Context), and students thinking about the source reliability (e.g., looking for educational or government sites rather than random sources). In addition to recognizing bias, some students were able to recognize when the skill of evaluating sources might be useful. One student (A2) commented that "a quick Google search might be appropriate for deciding who's right on a certain movie fact or something. But if you're doing a research project like the ones we're currently doing, then it does require more investigation and citations and things like that".

Though focus groups and observations revealed students' ability to evaluate information sources, particularly for bias, the annotations students submitted did not reveal the same skill level. The sources students chose were generally reliable, indicating students' ability to evaluate online information sources. However, students struggled to articulate their evaluation process. In the source annotations, most students said their sources were "good" because they had "helpful information" about their topic. Even if students chose a reliable source, their annotations mainly focused on content, not evaluation.

Of the students who mentioned evaluating sources in their annotations, one (F2) got really excited about the Library of Congress site, saying, “GREAT SITE! Always reliable! Use this for other things!”. Another student (C3) recognized the New York Times as a reliable source, while another (B3) used biography.com, a product of A&E channel, to “fact check my original facts”. When researching Pablo Picasso, B2 said she found “reliable and specific information that I hadn’t seen on other sources” on the website of a professional art gallery in California. E4 found a blog on her topic, Louis Armstrong, that she said had “good opinions”—if you are “looking for opinions”. The author of the blog has a degree in music studies, published a book on Louis Armstrong, and works at the Louis Armstrong History Museum. This annotation indicates an ability to have a nuanced perspective on reliability—just because a source is a blog does not automatically mean it is unreliable. Finally, B7 found useful information on Frida Kahlo, but said in her annotation that she “had a hard time deciding whether it was a trustworthy website”. The website in question is privately owned and does not have author or publishing information, so she was right to be critical, yet she still used the source.

Changes in Students’ Self-Efficacy (RQ5)

To answer RQ5 (What is the change in eighth-grade students’ self-efficacy toward their own IL skills based on participation in the intervention program?), the researcher conducted qualitative data analysis of researcher field notes from classroom observations and transcripts of student focus groups.

The whole-group discussions after each lesson revealed that students were sometimes aware of their lack of skills. For example, several students remarked that they were not good at identifying bias in sources. B2 even said "I feel like I should be more aware, but it won't always be the case". During discussion, B3 remarked that after completing the Checkology lessons, she "might be better at finding (bias)", but that it would be harder to apply the skill. This quote indicated a mixed impact on the student's self-efficacy toward evaluating sources. She had a positive self-efficacy toward detection, but a negative self-efficacy toward application of that skill. During a whole-group discussion, student E4 felt more confident in her ability to be critical of information sources, sharing that the Checkology lessons "made me feel like I would be ready for things in the future" and that "knowing which is evidence and which is opinion… really would help me". During independent research, several students asked the librarian or their social studies teacher for help. When this happened, the librarian and teachers encouraged students to evaluate the source on their own. However, most students worked independently and did not request assistance in evaluating sources.

In the focus groups, several students acknowledged their improved skills, indicating a positive impact on students' self-efficacy. One student recognized "I'm a lot better at citing my sources now" and another said "now I feel like I've got a better understanding" of evaluating sources. A few students also remarked that they already had positive self-efficacy of their evaluation skills before the instructional unit, but the lessons helped them to improve on their skills even further.

Discussion

The study tested the hypothesis that students who participated in the designed instructional unit would increase their ability to evaluate online information sources and improve self-efficacy toward IL skills. This section will discuss and explain findings from the intervention. The conceptual framework and research questions frame the discussion.

Conceptual Framework

The ISP model (Kuhlthau, 1990), which provides a systematic approach to the ISP, had been considered early in the research process. Due to time constraints and practical applications, the model was not referenced during the lesson planning time. Teachers were therefore unaware of the ISP model. However, during observations, it became clear that the students experienced each of the stages (initiation, selection, exploration, formulation, and collection). This caused the researcher to go back and review the intervention for alignment. Through this review, the researcher was able to identify that each of the intervention components aligned with the ISP model.

Within the intervention, students experienced the initiation, selection, exploration, formulation, and collection stages. Students also experienced the final stage, presentation, in class after the intervention concluded. The initiation stage involves recognition of a need for information. Students experienced this first stage of the information search process when the librarian and social studies teachers introduced the project goals and rubric. The selection stage occurred when students chose their topic, or the specific person that they would research for the project. Then, exploration occurred when students gathered general information about their individual during the 'read-around' portion of research. Students spent some time reading articles from library-approved databases, accessed from the grade-level LibGuide, as a starting point for information gathering. Students entered the exploration and formulation stages as they gathered more detailed information from individually chosen sources. As they developed a thesis statement, students may have alternated between these stages. In this project, students had to determine whether the individual they were researching challenged or maintained the status quo of their time. As students learned more about their individuals, they began to collect specific information related to their chosen thesis argument. The collection stage may also have continued beyond the intervention, as students were not required to present until later in the semester. Students were required to submit a written assignment and also convey their research findings in an oral presentation to their class.

Process Evaluation

The process evaluation research questions focused on adherence, dose delivered, and participant experience. Findings indicated successful adherence to the intervention design, as the instructional unit occurred within 93% of the allotted class time. However, the dose delivered was different than the planned intervention. The planned intervention included three Checkology lessons over four class sessions, but during implementation students completed the three lessons in one less session than expected. Therefore, the researcher had to add activities to the fourth session of the instructional unit. Upon consultation with the social studies teachers, six of seven classes completed an additional Checkology lesson and one class participated in a Harkness-style discussion (Trustees of Phillips Exeter Academy, 2019). During the focus group, the student (B8) from the class that did the Harkness reflected that it "help(ed) us because we were connecting what we had just learned into what we know in everyday life, what we know now".

Overall, students reported a positive experience with the intervention components. Students enjoyed completing the Checkology lessons and expressed excitement at the beginning of each class. During focus groups, students said that they liked the program and found it useful in teaching them about bias in sources. As one student (B8) explained, "I thought that it was a fun way to kind of learn and engage in an activity that requires you to both think and to just retain information about what's going on (…) I thought it was fun". Complaints about the program were minor. One of the lessons included a vocabulary activity that some students found confusing, however, students expressed that they were still able to understand the concepts behind the terms. As one student (E1) exclaimed, "I don't feel that it's imperative that I get the specific information and know that's fabricated versus altered versus all this stuff. Being able to identify it is the point". Another lesson asked students to write down their personal biases, which some students seemed uncomfortable with posting online. Finally, a few students found some of the lesson topics unrelatable, though other students expressed the opposite impression. Checkology is a preexisting program, so the researcher cannot make modifications to the individual lessons. However, the researcher could consider sending student feedback on specific elements to Checkology program designers for possible incorporation into future versions.

The discipline-based approach allowed students to connect the concepts learned during the Checkology lessons with the existing classroom curriculum. Furthermore, students were able to make connections to other classes, not just social studies, as well as make connections to projects from previous grades. Connections occurred both during whole-group discussions and as part of the research assignment. The research assignment also allowed students to immediately apply the concepts they learned. This was evident in students' remarks on research days and also in reflections made during focus groups. This finding supports existing research that states a discipline-based approach exposes students to the most relevant information for their research (Dotson & Diaz, 2008) and that it enhances student performance and understanding (Jackson, 2007).

The teacher-librarian collaboration also provided a positive experience for students. The librarian was involved in the lesson planning process, ensuring that the instructional unit aligned with existing IL skills instruction. She was also involved during the intervention, attending most of the class sessions that involved Checkology lessons and whole-group discussions. The librarian completed the same lessons that students did within the program, to gain a better perspective on the student experience, and asked questions during whole-group discussions. During the research portion of the intervention, the librarian-teacher collaboration was evident through a co-teaching pattern of instruction. The teacher and librarian both provided guidance and instruction for students through explanation of the project, demonstrating different resources and tools, and providing support to individual students when needed. Students were clearly comfortable with the librarian and did not hesitate to ask her questions throughout the research process. When the researcher asked students if the librarian was helpful, all focus group participants were affirmative in their responses. One student even mentioned that the librarian had previously taught them how to evaluate sources, and that Checkology helped them to be "more aware" (C1) of potential bias in sources. A positive relationship between students and the librarian supports existing research that considers teacher-librarian collaboration a critical component in successful IL design and instruction (Anderson & May, 2010; Becker, 2013; Greer et al., 2016).

Existing research states that gamification, specifically earning badges, can positively impact learner achievement, attitude, and motivation (Abramovich et al., 2013; Sun-Lin & Chiou, 2017). Research also shows that gamification as part of IL skill instruction increased student engagement and library usage (Pun, 2017; Walsh, 2014) and improved learning outcomes (Ford et al., 2015; Laubersheimer et al., 2015). However, one study found no positive impact on learning when students were required to participate in gamification programming (Hanus & Fox, 2015). In this intervention, student perceptions did not seem to be influenced by earning badges and points. In the focus groups, students said they noticed when they earned points in Checkology, but did not feel motivated by them. One focus group participant said she was motivated by the points, but only because she was "really competitive" (C1). Additionally, data from classroom observations did not reveal any discussion or student remarks regarding gamification elements. However, the participation rate was still high with 70% of potential badges and 93% of potential points earned by students.

Perhaps students were already highly engaged and motivated within the classroom learning environment. Perhaps some students perceived the gamification elements as motivating, but did not express their opinion during class. Perhaps the gamification elements did have a positive impact on students' engagement and motivation, but the students were unaware. Or perhaps there was no relationship between gamification and students whatsoever. Based on the data collected during this intervention, it is difficult to determine any relationship between gamification and student engagement or motivation.

Outcome Evaluation

Regarding students' assessment scores, statistical analysis showed a significant difference in students' ability based on results from a paired t-test of the preintervention ($M=6.92$, $SD=1.56$) and postintervention ($M=7.79$, $SD=1.06$) TRAILS with the following conditions: $t(23)=-3.49$, $p = 0.002$. The significant difference in assessment results indicates a possible relationship between the intervention and student's ability to evaluate online information sources. In looking at students' responses to individual questions on the TRAILS, question five (see Appendix F) provided interesting results. On the preintervention assessment, only six students answered the question correctly, but all students answered it correctly on the after the intervention. The question asked students the following: "Your group has selected the Arctic National Wildlife Refuge in Alaska as a research topic. As you are researching, you read a fantastic quote attributed to attorney Paul Achitoff of Earthjustice. What should be your next step?". Students who answered incorrectly on the preintervention assessment chose the option "Discuss the appropriateness of the quote with the members of your group". The correct answer was to "Verify that the attorney works for Earthjustice and learn more about the organization". This suggests an increase in students' critical evaluation of sources, however, results from one question do not provide significant data to make any conclusive statements.

Qualitative data also supported the quantitative findings that indicated a significant difference in students' skills. During independent library research, students were observed being critical of sources and often remarked on the credibility of a source before using it for information. For instance, students would ask who the author of a website was or look at the URL to determine the type of information that site contained. One student said of her source, “this seems trustable – oh yeah, I see the author”, while another told the librarian she knew her source was reliable because the information came from an accredited university.

Several students remarked during the focus groups that Checkology helped them to be more aware of bias, both in sources during research and also in their personal lives. One student (B8) also made a connection between the Understanding Bias lesson (News Literacy Project, 2019d) and the social studies curriculum, saying that “in history, bias comes up a lot in a lot of the information and the characters and people that we’re learning about. And so, I do think that—I think that I’m probably more aware of things. When I read something I probably do realize that that’s bias when probably before I may have realized it was biased but kind of didn’t really connect the dots and see it as bias even though it kind of – I thought it was bias but now I can *know* if something is bias”.

Students chose reliable sources for their research, indicating their ability to evaluate online information sources. Even so, students’ source annotations tended to focus on content rather than critical evaluation of the source itself. Upon reflection, the researcher realized that source annotations do not serve as strong indicators of a students’ ability to evaluate online information sources. Rather, annotating sources is a separate IL skill that students also need instruction and practice to master. Evaluating a source is a different process than explaining the evaluation process. In the intervention, students were told to create a source annotation for their independently chosen sources, but did not receive explicit instruction in creating them. The only guidance they received was from the librarian who told students in one class to explain "was this source good, was it helpful, and maybe a little summary of what it helped you find out, and that would be a good annotation". Based on these limited instructions, it is not surprising that students created content-focused source annotations. This portion of the intervention was not executed in a way that set students up for success. As such, the source annotations should not be used to determine students' ability to evaluate online information sources.

With a fixed-effects, mixed-methods, quasi-experiment, it is difficult to determine the exact relationship between the intervention and students' skills. Yet, quantitative data revealed a significant difference in students' skills and qualitative data supported that result. During classroom observations, students appeared to engage with content during the Checkology lessons and whole-group discussions. The gamified and interactive elements of Checkology may have helped students stay engaged and motivated during class, as many students found it "fun" to participate. Students also demonstrated critical evaluation of sources during classroom observations of the independent research class sessions. The immediate application of content from Checkology lessons to the independent research projects seemed to help students better retain concepts. Perhaps the discipline-based approach also helped students to make connections between IL and what they were learning in social studies or other core classes. The teacher-librarian collaboration also provided students with support through all portions of the intervention, but particularly during the application phase. Therefore, data indicates that a discipline-based, gamified approach to IL instruction with teacher-librarian collaboration may have a positive impact on students' abilities, particularly toward evaluation of online information sources.

Regarding self-efficacy, several students remarked on their existing or improved confidence in their ability to evaluate online information sources for bias. B8 noted that "I'm a lot better at citing my sources now. Kind of knowing if something is real or fake or credible or not credible helped a lot with my NoodleTools and citing it". Students also acknowledged a greater awareness or confidence in identifying bias in sources during focus groups and whole-class discussions. During library research, the researcher observed most students working independently, suggesting their confidence in their ability to find quality sources without assistance. There were a few students who seemed hesitant and asked for support from adults. The data gathered on self-efficacy was limited, so it is difficult to make a claim regarding the relationship between the intervention and students' self-efficacy.

Limitations

There are several limitations on this research including sample size and composition, the school environment, the length of the instructional unit, practice effect, and reactivity. The researcher aimed to include all 92 eighth-grade students as study participants, but the final student participation rate was only 26% (N = 24) of the target population. Most students were unable to participate in the research study not because their parents did not allow it, but because their parents did not turn in the consent form. Though the researcher sent eighth-grade parents several reminder emails, the researcher was unable to contact individual parents either by email or phone due to constraints within the professional context. Also, parents received access to the form after the school year began, meaning it was treated separately from the other beginning of the year forms that parents are required to submit before their student enrolls. The homogenous sample also impacted the study as all study participants were female. Furthermore, Harper Valley is a highly competitive school, which means students tend to be highly motivated and skilled students. Results may differ if the intervention were conducted with different, heterogeneous student populations.

As an all-girls, college preparatory school, the school's unique environment may have yielded different results than what might be seen in other school contexts. While the intervention was designed based on existing research, a homogenous population makes it difficult to generalize results. Also, constraints within the school impacted research design. For example, the intervention used a fixed-effects design because the middle school requires all students receive the same curriculum. A fixed-effects design reduces sources of bias originating from student differences, but also reduces generalizability due to a limited sample size (Henry, 2010). This constraint may not be present in other contexts and thus might impact research design elements.

The length of the instructional unit might also be considered a limitation. The researcher designed a week-long instructional unit to minimize the impact on the social studies teachers' existing curriculum. However, a longer instructional unit might provide an increase in data points.

Students took the same assessment before and after the intervention. While the intention was for students to take the preintervention assessment at the beginning of the year, that did not occur due to external constraints and low participation rates. Students first took the TRAILS assessment the week before the intervention, then took the same assessment again within a few weeks of finishing the intervention. Because the time between students taking the assessment was only a few weeks, practice effect (Shadish et al., 2002) may have led to an increase in student scores, rather than the intervention itself. Also, reactivity may have occurred. All participants were aware that a research study was being conducted and may have acted differently as a result.

Implications for Practice

This research study suggests that a discipline-based, gamified, teacher-librarian collaboration approach to teaching IL skills can positively impact students' self-efficacy toward and ability to evaluate online information sources. The discipline-based approach allows students to make connections to the existing curriculum. Gamification (e.g., badges, points), may engage or motivate students and contribute to an overall positive learning experience. The teacher-librarian collaboration provides students with additional support during the research process.

A discipline-based approach to IL instruction had a positive impact on students' learning experience and skill development. Therefore, educators seeking to address gaps in students' IL skills should consider developing a scope and sequence for IL instruction. This would provide a road map for faculty and ensure comprehensive instruction across grade levels and subject areas, facilitating the success of a discipline-based approach. Standards from professional organizations such as the American Association of School Librarians or ISTE can help guide development of a comprehensive, schoolwide curriculum.

Perhaps the most valuable insight from this research study was the critical nature of the relationship between the teacher and librarian. The students clearly benefited from teacher-librarian collaboration. The librarian acts as an expert in IL instruction as the teacher connects IL skills to curriculum in their specific subject. The researcher noted the value of the librarian being involved during the planning process and also during classroom observations. Students also noticed the value of the teacher-librarian collaboration. They were not afraid to ask the librarian for help during independent research. Also, focus group participants remarked on how much the librarian helped them to develop IL skills, including evaluating sources. Schools should take the importance of teacher-librarian collaboration into account during budgeting and decision-making. Additional time for teaching faculty to meet with librarians might better facilitate teacher-librarian collaboration. Additionally, the librarian should have a flexible schedule in order to attend different classes as instructional support during research.

Schools interested in exploring gamification for IL skills instruction might consider adopting the Checkology program. Alternatively, schools could explore using a different website that provides similar gamified features such as badges, points, and interactive media. However, librarians or teachers wanting to incorporate gamification elements into IL skills instruction may want to gather additional research before implementation, as discussed in the next section.

Implications for Research

Additional research should be conducted related to IL instruction that explores different contexts, populations, intervention components, and research design elements. Other contexts might include co-educational institutions, different school types (e.g., charter schools, public schools), or different geographic locations (e.g., the Midwest, the Pacific Northwest). Other student populations might include students in different grade levels, mixed-gender classrooms, or those with more diverse students (e.g., ethnicity, race, socioeconomic status).

Another consideration for additional research includes further exploration of intervention elements including the discipline-based approach, gamification, and teacher-librarian collaboration. The elements of a discipline-based approach and teacher-librarian collaboration seemed to provide a positive experience for students. Further exploration of these elements might provide additional support for including these intervention elements. Findings did not indicate a positive impact from badges and points on students' engagement or motivation. However, many students liked the interactive features of the Checkology lessons. Future research could examine the impact of different gamification elements or further explore the relationship between classroom instruction, gamification, and interactivity as a motivational tool.

Future iterations of this research might apply different design elements. For example, researchers might explore different pacing of the instructional unit, adjusting based on classroom and student needs. Researchers might also consider intervention timing—for example, creating a longer instructional unit or spacing out the same unit over a longer time period. Additionally, researchers could consider further exploration of Checkology and its impact on the student learning experience, or different instructional platforms could be used. Finally, different variables could be examined further, such as a deeper exploration of student self-efficacy.

Conclusions

In this research study, eighth-grade students participated in a week-long instructional unit that involved a discipline-based, gamified approach with teacher-librarian collaboration to teach the IL skill of evaluating online information sources. Students worked individually to complete lessons in the Checkology virtual platform, participated in whole-group discussions, and applied learned knowledge from the platform to independent research. This study found a significant difference in students' ability to evaluate online information sources as measured by the Evaluate Sources and Information subsection of the ninth-grade TRAILS (Kent State University Libraries, 2017) and through classroom observations and student focus groups. This study also found a positive effect on students' self-efficacy through qualitative data analysis. Overall, students had a positive experience with intervention elements. The discipline-based approach and teacher-librarian collaboration had the most impact on students' experience, the connection between gamification and student motivation was less clear.

While this research study revealed promising results to address the gaps in students' information literacy skills, additional research should be conducted to mitigate some of the limitations of this study. Constraints within the professional context limited research design, including placement of students into control and treatment groups, as well as limited time within the classroom. Additionally, the study was conducted at a school with a homogenous population of mostly affluent, white, and all female students. Furthermore, the study only included a select number of students per class, rather than the target study population of the entire eighth grade, which limited generalizability of results. Considerations for future research might include studies with varied contexts and populations, exploring different aspects of the intervention components, and modifying research design elements. Though the study presented limitations, the study is still significant because it helped to determine the impact of different strategies on IL skills instruction. It found a discipline-based approach with teacher-librarian collaboration to be a positive impact on student self-efficacy and skills. While the impact of gamification elements on student motivation was limited, the interactive features of the Checkology program did have a positive impact on the student learning experience.

Students often struggle to find, evaluate, and effectively use reliable information sources, both print-based and online (Bowler, 2010; Chung & Neuman, 2007; Julien & Barker, 2009; Metzger et al., 2015; Probert, 2009; Stanford History Education Group, 2016). As such, schools should address the gaps in students' IL skills by designing comprehensive interventions with a discipline-based, gamified approach that promotes teacher-librarian collaboration. These strategies facilitate a constructivist perspective, as students learn to actively engage with information for learning. They also facilitate cognition, as the information search process requires individuals to use cognitive skills to interact with information in a meaningful, purposeful way.

IL skills are critical for successful participation in the digital age (Collins & Halverson, 2010; Hobbs, 2010). Instruction should not be limited to one grade level or subject area, but rather a continuous part of a students' learning experience. It should connect with the curriculum through a partnership of classroom teachers and academic librarians, as both provide critical contributions to student learning. The information search process is a complex one that requires individuals to actively engage with information to make meaning. As one student noted: "Just one thing on Checkology wouldn't make you an expert on something. You kind of have to use that and continue to build off of it and grow so it can really stick in your brain until you fully understand something".

Appendix A

Student Assent Form/Survey for Needs Assessment

The purpose of this research study is to determine how student information and media literacy skills impact classroom learning.

If you have any questions, please contact Caitlin McLemore at:
Phone: [redacted]
Email: [redacted]

If you have any issues, please contact the Homewood Institutional Review Board at Johns Hopkins University at (410) 516-6580.

When you click 'Next' you are agreeing to participate and the survey will begin. To discontinue participation, stop answering questions and close the browser tab containing the survey.

Age:

Ethnicity:
- White
- Hispanic
- African-American
- Asian
- Native American
- Other

Do you have a computer at home?
- Yes
- No

Do you have Internet at home?
- Yes
- No

How many hours a week do you generally spend:

	0-2 hours	3-5 hours	6-8 hours	9-11 hours	12+ hours
On the Internet for school or work					
On the Internet in your free time					
Watching TV (not on your computer)					
Reading books, magazines, or print newspapers					
Playing games (online, on your cell phone, on Playstation, Wii, Xbox, etc.)					

On average, how many hours a week do you spend on...

	0-2 hours	3-5 hours	6-8 hours	9-11 hours	12+ hours
Facebook					
Twitter					
YouTube					
Instagram/Snapchat/other social networking sites					
Messaging Apps/Boards (GroupMe, WhatsApp, etc.)					
Games (online, on your cell phone, on PlayStation, Wii, Xbox, etc.) - by yourself					
Games (online, on your cell phone, on PlayStation, Wii, Xbox, etc.) - with other players					
Blogging (Blogger, Tumblr, etc.)					
Podcasting					

How often do you create projects that use video, audio, music, photographs, etc. outside of school time?

Often
Sometimes
Rarely
Never

Are you familiar with the concept of "media literacy"?

No
Yes

If yes, how would you define "media literacy"?

NOTE: For all the questions below, the possible answers were: Almost Never True, Usually Not True, Sometimes but Infrequently True, Occasionally True, Often True, Usually True, Almost Always True

I feel confident and competent to:

Use different kinds of print sources (i.e. books, periodicals, encyclopedias, etc.)

Use electronic information sources (databases, search engines, websites, etc.)

Locate information sources in the library

Use library catalogue

Locate resources in the library using the library catalogue

Define the information I need

Select information most appropriate to the information need

Interpret the visual information (i.e. graphs, tables, diagrams)

Write a research paper

Prepare a bibliography

Create bibliographic records for different kinds of materials (i.e. books, articles, web pages)

Make citations and use quotations within the text

Learn from my information problem solving experience and improve my information literacy skill

Synthesize newly gathered information with previous information

Determine the content and form the parts (introduction, conclusion) for a presentation (written, oral)

Create bibliographic records and organize the bibliography

Criticize the quality of my information seeking process and its products

NOTE: For all the questions below, the possible answers were: Strongly Disagree, Disagree, Neither Agree or Disagree, Agree, Strongly Agree

I have incorporated other people's public work to create my own piece of art, like mixing music tracks, making an art collage, or stringing together video clips.

I have created something new that incorporates stuff from popular culture, like writing a short story based on a character in my favorite book, making a fan video, or a music remix.

When doing a creative multimedia project, I don't think it is wrong to take samples from my favorite artists' songs or videos.

If I would make a fan video about my favorite celebrity or artist or band, they'd probably be happy if they found out about it.

It is important for young people to learn how to use stuff from popular culture in their own creative ways.

I don't agree that people are born smart.

My environment plays a big part in how smart I am.

I have to keep learning from my surroundings in order to become smarter.

I'm usually pretty good at knowing what to do or who to ask if I want to find out more about a specific topic.

I find it important to use tools like spell check, a calculator, encyclopedia, etc. to help me in my learning or work.

I enjoy working with others on projects or assignments.

When I can't solve a problem or find a piece of information by myself, I use the internet or social media to connect with others and find what I am looking for.

I enjoy the collaborative aspect of things like Wikipedia, team games, online fan communities, community message boards, etc.

I think I can learn a lot from my friends.

I don't think it's a sign of weakness or stupidity to ask a friend or a colleague for help on work assignments or other problems.

I can effectively determine whether or not the information I find online is correct and reliable.

When I'm interested in a topic, I gather information from a bunch of different sources (like TV, radio, the internet, etc.) to try to get the full picture.

When I search for something online and I get thousands of results, I can effectively decide which ones will be the most useful for me.

I am able to enter the right words in a search engine to find what I am looking for.

I can identify prejudice or bias in media (e.g. racism on certain websites, prejudice against women in song lyrics, etc.).

I think that reading other people's recommendations on sites like Amazon or Yelp is useful in helping me make decisions.

I like to share my favorite links or creative work on social media sites like Facebook or YouTube or Twitter.

I often share links on Facebook, Twitter, my blog, etc.

When I go online, I like to feel like I am part of a community.

It is important for me to able to stay in touch with my friends online too, and not only in real life.

I feel I understand things better when I can think of them visually.

When I prepare a project for work or school, I like to use as many images, graphs and diagrams as possible.

I think I am pretty good at understanding information from images, graphs, diagrams and other visual tools.

I like the fact that I can see all my friends on my social media profiles.

I find Google Maps and/or Google Earth to be extremely useful tools.

Appendix B

Teacher Consent Form/Survey for Needs Assessment

Teacher Beliefs on Media Literacy
Title: Information and Media Literacy Skills in Students
Principal Investigator: Dr. Christine Eith, Assistant Professor, Johns Hopkins University School of Education
Secondary Investigator: Caitlin McLemore, Doctoral Student, Johns Hopkins University School of Education
Date: April, 2017

PURPOSE OF RESEARCH STUDY:
The purpose of this research study is to determine how student information and media literacy skills impact classroom learning.

PROCEDURES:
There will be several parts of this study:

1. Your curriculum map in Atlas may be analyzed (as part of a broader analysis)
2. You will be asked to complete one electronic survey on Media Education. As a follow-up to the survey, you may be asked about participating in classroom observations.

RISKS/DISCOMFORTS:
There are no expected risks for participating in this study.

BENEFITS:
This research is part of a broader needs assessment that seeks to understand information and media literacy skills in students. The findings of the needs assessment will help inform and guide improvements in teaching and learning these skills. By participating, you will contribute your voice to a larger group and increase the overall response rate. A high response rate provides higher levels of accuracy and confidence in the results, thus helping to design a more meaningful intervention.

VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:
Your participation in this study is entirely voluntary: You choose whether to participate. If you decide not to participate, there are no penalties, and you will not lose any benefits. If you choose to participate in the study, you can stop your participation at any time, without any penalty or loss of benefits. If you have any questions, please contact Caitlin McLemore at [redacted]

CONFIDENTIALITY:
Any records that identify you will be kept confidential. The records from your participation may be reviewed by members of the Johns Hopkins University Homewood Institutional Review Board to make sure that the research was done properly. Otherwise, records that identify you will be available only to people working on the study. No

identifying or individual information will be included in any research publications. Surveys will be collected in an electronic format and collected data will be stored using a password protected Qualtrics account. The survey will not include identifiable information. Audio recordings of classroom observations may occur but will not include identifiable information. Handwritten notes will use participant numbers or fake names. Researchers may transcribe handwritten notes and recordings to an electronic format. All research data will be kept in a locked office or stored on a password-protected computer. Any electronic files will be erased and paper documents shredded, ten years after collection.

COMPENSATION:
You will not receive any payment or other compensation for participating in this study.

IF YOU HAVE QUESTIONS OR CONCERNS:
You can ask questions about this research study at any time during the study by contacting Caitlin McLemore at [redacted]. If you have issues or feel that you have not been treated fairly, please call the Homewood Institutional Review Board at Johns Hopkins University at (410) 516-6580.

WHAT YOUR SIGNATURE MEANS:
Your signature below means that you understand the information in this consent form. Your signature also means that you agree to participate in the study. By signing this consent form, you have not waived any legal rights you otherwise would have as a participant in a research study.

I understand the information in this consent form and agree to participate in the study.

- Yes
- No

By clicking next, you are agreeing to participate and the survey will begin. At any point, if you wish to stop participation, you may do so by clicking out of the browser tab.

Gender

- Male
- Female
- Other

Ethnicity

- White
- Hispanic
- African-American
- Asian
- Native American
- Other

What is your highest degree obtained?
Bachelor's (B.A., B.S. etc.)
Master's (M.A., M.Ed., M.Sci., etc.)
Doctorate (Ed.D., Ph.D., etc.)

How long have you been teaching?

How long have you been teaching at this school?

What grades do you teach? Check all that apply.
5th Grade
6th Grade
7th Grade
8th Grade
9th Grade
10th Grade
11th Grade
12th Grade

What subjects do you teach? Check all that apply.
English/Language Arts
Foreign Language
History/Social Science
Math
Science
Other

What is information literacy?

What is media literacy?

NOTE: For all the questions below, the possible answers were: Strongly Disagree, Disagree, Neither Agree or Disagree, Agree, Strongly Agree

Students are influenced heavily by visual messages in media.

Students are more influenced by TV/movies than by the printed word.

It is important students be taught to analyze media messages.

It is important students be taught how to detect bias in media.

It is important students be taught how to recognize false or misleading information in media.

It is important for students to understand media as a window on the world (i.e., a learning tool and source of information).

It is important for students to understand how to evaluate media critically.

It is important for students to understand that media content is subjective.

It is important for students to understand how to self-regulate their media use.

It is important for students to understand how to tell fact from fiction in media.

It is important for students to understand how media works.

It is important for students to understand that media sell products and ideas.

It is important for students to understand that media can be hypnotic/addictive.

Media should be studied in elementary school.

Media should be studied in middle school.

Media should be studied in high school.

Using media examples makes learning more enjoyable.

Using media examples makes learning more complex concepts easier.

On a scale of 1 to 7, with 1 being not competent and 7 being highly competent, answer the following questions about your students.

______ How competent are your students at distinguishing program content versus ads?
______ How competent are your students at distinguishing fictional content from reality?
______ How competent are your students at identifying values portrayed in media?
______ How competent are your students at choosing media content that is valuable and useful to them?
______ How competent are your students at analyzing program values (e.g., identifying prejudice and discrimination, recognizing stereotypes)?
______ How competent are your students at realizing the need to limit their media use?
______ How competent are your students at creating media content?

NOTE: For all the questions below, the possible answers were: Strongly Disagree, Disagree, Neither Agree or Disagree, Agree, Strongly Agree

The most significant barrier to media education in my school is parental objections.

The most significant barrier to media education in my school is administration objections.

The most significant barrier to media education in my school is lack of teacher training.

The most significant barrier to media education in my school is lack of equipment.

The most significant barrier to media education in my school is lack of materials.

The most significant barrier to media education in my school is lack of time.

The most significant barrier to media education in my school is ...

Please rate the importance of students' understanding of the following mass media elements on a scale of 1 to 10, where 1 = Not at all Important and 10 = Very Important. The same rating may be used for more than one item. For example, you may think ethics and the future in media are equally important, so you may give them both an 8.

______ Demographics/personal characteristics of media staffers
______ Economic factors/foundations in media
______ Ethics in media
______ Future/trends in media
______ History of media
______ Legal rights/restrictions related to media
______ Potential effect of media messages on people
______ Problems associated with news reporting
______ Public perceptions of media and media staffers
______ Roles and responsibilities of media in society
______ Structure/procedure/policies in media
______ Technologically related aspects of media

Appendix C

Parental Consent Form for Needs Assessment

Title: Information and Media Literacy Skills in Students
Principal Investigator: Dr. Christine Eith, Professor, Johns Hopkins University School of Education
Secondary Investigator: Caitlin McLemore, Doctoral Student, Johns Hopkins University School of Education
Date: April, 2017

PURPOSE OF RESEARCH STUDY:
The purpose of this research study is to determine how student information and media literacy skills impact classroom learning.

PROCEDURES:
There will be several parts of this study:

1. Your daughter's classroom may be observed.
2. Your daughter will be asked to complete one online survey sent via email.

All student information will be kept confidential. For more details, see below.
Time required: The survey should take about 15-20 minutes to complete.

RISKS/DISCOMFORTS:
There are no expected risks to students.

BENEFITS:
This research is part of a broader needs assessment that seeks to understand information and media literacy skills in students. The findings of the needs assessment will help inform and guide improvements in teaching and learning these skills. By participating, your daughter will contribute her voice to a larger group of students and increase the overall response rate. A high response rate provides higher levels of accuracy and confidence in the results, thus helping to design a more meaningful intervention.

VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:
Your daughter's participation in this study is completely voluntary. You and your daughter choose whether your daughter will take part in the study. There are no penalties for choosing not to participate. Your daughter can stop her participation in the study at any time, without any penalty. If you or your daughter have any questions, please contact Caitlin McLemore at [redacted].

CONFIDENTIALITY:
Any records that identify you or your daughter will be kept confidential. The records from your daughter's participation may be reviewed by members of the Johns Hopkins University Homewood Institutional Review Board to make sure that the research was done properly. Otherwise, identifiable records will be available only to people working on the study.

No identifying or individual information will be included in any research publications.

Surveys will be collected in an electronic format and collected data will be stored using a password protected Qualtrics account. The survey will not include identifiable information.

Audio recordings of classroom observations and focus group interviews may occur but will not include identifiable information. Handwritten notes will use participant numbers or fake names. Researchers may transcribe handwritten notes to an electronic format.

All research data will be kept in a locked office or stored on a password-protected computer. Any electronic files will be erased and paper documents shredded, ten years after collection.

COMPENSATION:
Your daughter will not receive any payment for participating in this study.

IF YOU HAVE QUESTIONS OR CONCERNS:
You and your daughter can ask questions about this research study at any time during the study by contacting Caitlin McLemore at [redacted]

If you or your daughter have questions about your daughter's rights or feel that your daughter has not been treated fairly, please call the Homewood Institutional Review Board at Johns Hopkins University at (410) 516-6580.

SIGNATURES
WHAT YOUR SIGNATURE MEANS:
Your signature means that you understand the information in this form.

Your signature also means that you agree to allow your daughter to participate in the study.

Your daughter's signature means that she agrees to participate in the study.

By signing this consent form, you and your daughter have not waived any legal rights your daughter would otherwise have as a participant in a research study.

Electronic Parent Signature ______________________________
Electronic Student Signature ______________________________
Date ____________

Appendix D

Descriptive Statistics of Students' ILSES for Needs Assessment

Question	Minimum	Maximum	Mean	SD	Variance
Use different kinds of print sources (i.e. books, periodicals, encyclopedias, etc.)	2	7	5.35	1.33	1.76
Use electronic information sources (databases, search engines, websites, etc.)	3	7	6.18	1.1	1.2
Locate information sources in the library	1	7	5.06	1.66	2.76
Use library catalogue	2	7	5.82	1.62	2.62
Locate resources in the library using the library catalogue	2	7	5.35	1.78	3.17
Define the information I need	2	7	5.47	1.46	2.13
Select information most appropriate to the information need	2	7	5.24	1.48	2.18
Interpret the visual information (i.e. graphs, tables, diagrams)	2	7	5.71	1.32	1.74
Write a research paper	3	7	5.29	1.02	1.03
Prepare a bibliography	1	7	4.47	1.91	3.66
Create bibliographic records for different kinds of materials (i.e. books, articles, web pages)	1	6	4.18	1.79	3.2
Make citations and use quotations within the text	3	7	5.82	1.34	1.79
Learn from my information problem solving experience and improve my information literacy skill	3	7	5.53	1.14	1.31
Synthesize newly gathered information with previous information	3	7	5.24	1.21	1.47
Determine the content and form the parts (introduction, conclusion) of a presentation (written, oral)	3	7	5.71	1.07	1.15
Create bibliographic records and organize the bibliography	1	6	3.94	1.59	2.53
Criticize the quality of my information seeking process and its products	1	7	5.06	1.63	2.64

Appendix E

Descriptive Statistics for Individual Questions on NML Skills Survey for Needs Assessment

Appropriation subgroup

Question	Minimum	Maximum	Mean	SD	Variance
4.1	1	5	3.06	1.11	1.23
4.2	2	5	3.53	0.92	0.84
4.3	2	5	3.35	0.76	0.58
4.4	2	5	3.65	1.03	1.05
4.5	3	5	4.24	0.73	0.53

Distributed cognition subgroup

Question	Minimum	Maximum	Mean	SD	Variance
4.6	2	5	3.59	1.09	1.18
4.7	1	5	3.88	0.90	0.81
4.8	3	5	4.29	0.57	0.33
4.9	2	5	3.88	0.76	0.57
4.10	3	5	4.35	0.59	0.35

Judgement subgroup

Question	Minimum	Maximum	Mean	SD	Variance
4.16	1	4	3.41	0.84	0.71
4.17	3	5	4.24	0.64	0.42
4.18	2	5	3.65	0.84	0.70
4.19	3	5	3.94	0.64	0.41
4.20	1	5	3.94	1.00	1.00

Networking subgroup

Question	Minimum	Maximum	Mean	SD	Variance
4.21	3	5	4.12	0.765	0.57
4.22	1	4	2.53	0.85	0.72
4.23	1	4	2.41	0.97	0.95
4.24	2	5	3.25	0.83	0.69
4.24	2	5	3.82	0.62	0.38

Visualization subgroup

Question	Minimum	Maximum	Mean	SD	Variance
4.26	3	5	4.00	0.49	0.24
4.27	2	5	3.76	0.64	0.42
4.28	3	5	4.24	0.55	0.30
4.29	3	5	4.12	0.68	0.46
4.30	3	5	4.06	0.73	0.53

Appendix F

Ninth-grade TRAILS Evaluate Sources and Information subsection
(Kent State University Libraries, 2017)

1. The terms contemporary and up-to- date refer to:
    coverage
    accuracy
    objectivity
    currency
    authority

2. Why is it important to evaluate a website's currency?
    Old information could be incomplete and/or incorrect.
    If the site is free, the information will likely be biased.
    If you can't find the date, MLA and APA rules do not allow you to use the information.
    Doing so keeps you up-to- date on technology trends.

3. You are doing a project on income versus expenditures in city government. You hear that your city spent 3 million dollars to snow removal last year, and you want to use this information in your PowerPoint presentation. What should you do to verify that this information is correct?
    Call a neighbor.
    Ask your parent or guardian.
    Call the police department.
    Call the city treasurer.

4. Read the excerpt below that comes from a travel industry magazine:
Deputy Director Hill of Horseshoe Cruise Line state the following about the mysterious illness aboard the 900-person cruise ship Royal Lady, "Including crew and guests, we believe that 766 passengers are presently ill. That is certainly not an epidemic. In fact, there is no reason to believe that this illness has anything to do with the food or facilities."
Does this excerpt illustrate fact, opinion, or bias?
    Fact
    Opinion
    Bias

5. Your group has selected the Arctic National Wildlife Refuge in Alaska as a research topic. As you are researching, you read a fantastic quote attributed to attorney Paul Achitoff of Earthjustice. What should be your next step?
    Discuss the appropriateness of the quote with the members of your group.
    Verify that the attorney works for Earthjustice and learn more about the organization.

Use the quote in your group’s research project because the quote supports the group’s argument.

6. You are responsible for writing a paper on the production of electricity in your state. Which resource is most likely to have objective information?

www.freetheplanet.org
The electric company that sets the rates for your electricity
The Greenworks Gazette
A coal company in your state
The U.S. Environmental Protection Agency (www.epa.gov)

7. You need to find reliable information about treatments available for headaches and plan to use an article from the periodical Pain-Free Living as your source. What is the most important thing to think about as you decide whether or not this is a reliable source?

How current is the periodical?
What experience does the author of the article have?
Who publishes the periodical?
All of the above

8. “Most disturbing of all, some researchers want to use cloning to create human beings solely for experimentation and destruction. They propose to supply genetically matched tissues for treating various diseases by making human embryos from patient's body cells, then dissecting these developing embryos for their ‘spare parts’. Some even speak of growing genetically altered ‘headless’ or ‘brainless’ human clones as organ farms.” You want to use this information in your research paper on cloning. What is your next step?

Verify the accuracy of the information.
Write your paper.
Plan your search strategy.
Define your topic.

9. When you evaluate a website’s coverage, which of the following do you not examine?

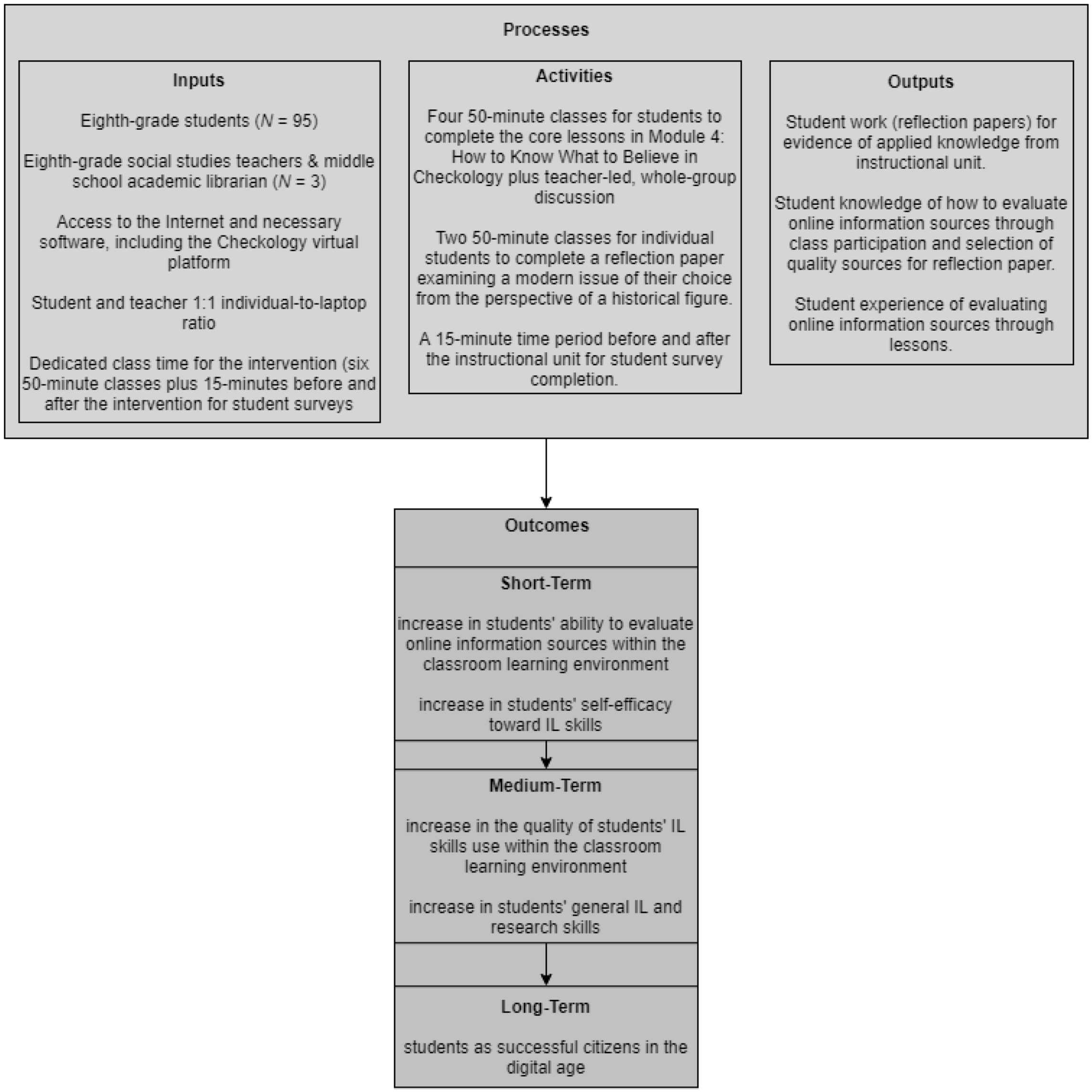
The depth of the material
If the website offers information that is not found in other websites or print sources
Who created the website, including his/her background (credentials)
If the links are relevant to the topic

10. Which of the following is the best criterion to use when evaluating a website?

The website is produced by a government agency or university.
The website is recommended by my friends.
The website is listed at the top of a Google search.
The website is cited by Wikipedia.

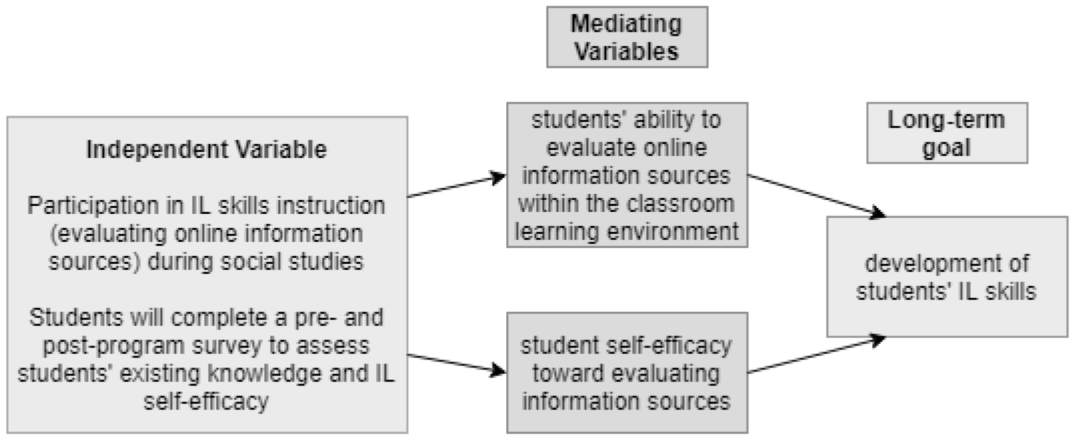
Appendix G

Intervention Logic Model



Appendix H

Intervention Theory of Treatment



Appendix I

Classroom Activities Time Log Example

Note: The first row below the titles includes example entries.

Class	**Activity**	**Description**	**Time Spent**
A Block Session 1	*Procedural*	*Announcements, collecting homework, taking attendance*	*10 min.*

Categories for classroom activities

Activity	**Description**
Procedural	*Announcements, collecting homework, taking attendance*
Instructional – General	*Explaining the program, student registration, basic instructions*
Instructional – Independent Student Work	*Students working independently in the Checkology program*
Instructional – Whole Group Discussion	*Whole group discussions*
Other	*Unexpected activities (e.g., fire drill)*

Appendix J

Attendance Sheet Example

Participant	S1	S2	S3	S4	S5	S6	S7	Notes

Appendix K

Checkology Class Reports

Student Code	Lessons	Points	Badges
A1	3	1285	2
A2	4	1535	4
A3	3	1500	4
C1	4	1520	4
C2	4	1480	4
C3	3	1320	3
D1	4	1535	4
D2	4	1390	3
D3	3	1225	2
D4	3	1510	4
E1	3	1500	4
E2	4	1460	4
E3	3	1120	2
E4	4	1515	4
F1	4	1505	4
F2	4	1470	4
F3	4	1405	3
F4	4	1545	4
F5	3	1275	2
F6	4	1360	3
F7	4	1515	4
Average	3.619048	1427.14	3.43
B1	3	1120	2
B2	3	1100	2
B3	3	1100	2
B4	3	1130	2
B5	2	945	1
B6	3	1130	2
B7	2	1095	1
B8	2	1045	1
Average	2.625	1083.125	1.625

Appendix L

Student Focus Group Protocol

Opening Script: "Thank you all so much for agreeing to participate in this focus group. I appreciate you taking the time out of your busy day to speak with me and share your thoughts. As you know, I am doing research on information literacy, specifically how students evaluate online information sources. Your parents have already consented for you to participate in this focus group. The purpose of this discussion is to give you an opportunity to share your perspective of how the intervention went.

At no time will your name or any other identifying personal information be shared. Anything that you share in the focus group will be kept completely confidential. There will be no names attached to your feedback and no teacher will know who said what.

I will be recording this interview to be sure that your comments are accurately recorded. You do not have to answer any questions that make you feel uncomfortable. Do you have any questions before we begin? [Wait for questions.] Let's begin."

Focus Group Questions
The questions are designed to be open and prompts will be used when needed.

Questions to include:
Questions about the instructional unit

- What was your experience with the Checkology virtual platform?
  - Did you find the core lessons helpful? In what ways?
  - What did you think about the badges, leaderboard, and points?
  - Did you learn anything new from the program? Did anything surprise you?
- What was your experience with the class discussions? Did you find them useful? In what ways?
- What was your experience with the reflection paper? Did you feel confident in your ability to choose appropriate information sources? Did the lessons influence how you worked on the reflection paper?

Questions about proximal outcomes

- Do you think that your ability to evaluate online information sources changed as a result of these lessons? If so, how?
- What is [your definition of] information literacy?
- How do you feel about your ability to find good sources of information online? Have your feelings changed since participating in these lessons?

Closing Script: "Again, thank you all so much for taking the time to participate in this focus group. I appreciate your time and thoughtfulness. If you feel that you have anything else you need to add later on, please feel free to share with me through email, or stop by my office to talk in-person."

Appendix M

Parent Consent Form for Intervention

Approved August 16, 2018 Protocol Number: HIRB00007608

Johns Hopkins University

Homewood Institutional Review Board (HIRB)

Parental Permission Form

Title:	Addressing Gaps in Eighth-Grade Students' Information Literacy Skills: A Mixed Methods Approach
Principal Investigator:	Wendy Drexler, Ph.D. Assistant Professor of Educational Technology Johns Hopkins University School of Education
Student Investigator:	Caitlin McLemore, Doctoral Candidate Johns Hopkins University School of Education
Date:	July 6, 2018

PURPOSE OF RESEARCH STUDY:

The purpose of this research study is to examine how student participation in an online, virtual platform might increase students' information literacy skills. Students will be participating in a previously planned instructional unit. Data will be collected to address research questions related to information literacy, evaluating online information, information literacy self-efficacy, and the components of the instructional unit. Any data that is collected will be confidential and not attributable to any particular student in the class. We anticipate that approximately 95 students will participate in this study. This study is being conducted by Caitlin McLemore, who is the Academic Technology Specialist at [redacted].

PROCEDURES:

There will be several parts of this study:

- Your daughter's classroom may be observed during previously planned lessons in social studies class for a period of six 50-minute classes.
- Your daughter will be asked to complete an electronic survey, twice, during social studies class. Each survey will take about 5-10 minutes to complete.
- Your daughter's feedback on a reflection paper, submitted in social studies class, may be reviewed.
- Your daughter may be asked to participate in a focus group (up to six students). One student will be chosen at random from each section of social studies. The focus group will take 30-45 minutes and happen during an open free period or study hall.
- The focus group may be audio-recorded for notetaking purposes.

RISKS/DISCOMFORTS:

The risks associated with participation in this study are no greater than those encountered in daily participation in class.

Parental Permission Form (11/05)
Page 1 of 4

Title: Addressing Gaps in Eighth-Grade Students' Information Literacy Skills: A Mixed Methods Approach
PI: Wendy Drexler, Ph.D.
Date: June 6, 2018

BENEFITS:
We expect that the study will help your daughter by teaching her strategies for evaluating online information sources. This study may benefit society if the results lead to a better understanding of how to provide information literacy skills instruction to middle school students. By participating, your daughter will contribute her voice to a larger group of students and increase the overall student response rate. A high response rate provides higher levels of accuracy and confidence in the results, thus helping to design a more meaningful intervention.

VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:
Your daughter's participation in this study is entirely voluntary. You choose whether to allow your daughter to participate, and we will also ask your daughter whether she agrees to take part in the study. If you decide not to allow your daughter to participate, or your daughter chooses not to participate, there are no penalties, and neither you nor your daughter will lose any benefits to which you would otherwise be entitled.

If you and your daughter choose to participate in the study, you or your daughter can stop participation at any time, without any penalty or loss of benefits. If you want to withdraw your daughter from the study, or your daughter wants to stop participating, please contact Caitlin McLemore at [redacted] or cmclemo3@jhu.edu.

CIRCUMSTANCES THAT COULD LEAD US TO END YOUR PARTICIPATION:
Under certain circumstances we may decide to end your daughter's participation before she has completed the study. Specifically, we may stop your daughter's participation if she enrolls at a different school or in a different grade level.

CONFIDENTIALITY:
Any study records that identify you or your daughter will be kept confidential to the extent possible by law. The records from your daughter's participation may be reviewed by people responsible for making sure that research is done properly, including members of the Johns Hopkins University Homewood Institutional Review Board and officials from government agencies such as the National Institutes of Health and the Office for Human Research Protections. (These people are required to keep your identity and the identify of your daughter confidential.) Otherwise, records that identify you or your daughter will be available only to people working on the study, unless you give permission for other people to see the records.

Study records will be created and stored on a password-protected laptop and/or a password-protected account. Students will work on a password-protected, web-based virtual platform using their school-issued laptops. Class reports from the virtual platform and student work will be downloaded and become part of the study records. Student surveys will be created and stored within Qualtrics, a password-protected web-based program designed for this purpose. The researcher will use code numbers rather than students' names on all data sheets.

Title: Addressing Gaps in Eighth-Grade Students' Information Literacy Skills: A Mixed Methods Approach
PI: Wendy Drexler, Ph.D.
Date: June 6, 2018

If students participate in a focus group, audio recordings will be transferred to and stored on a password-protected, school-issued laptop. No identifying information will be included with audio recordings. Instead, the researcher will use code numbers rather than students' names.

All data, including audio recordings, will be destroyed five years after the conclusion of the study.

COSTS
There are no costs to participants or their parents.

COMPENSATION:
Your daughter will not receive any compensation for participating in this study.

IF YOU HAVE QUESTIONS OR CONCERNS:
You can ask questions about this research study now or at any time during the study, by talking to Caitlin McLemore at [redacted] or cmclemo3@jhu.edu, or Wendy Drexler at wdrexle1@jhu.edu.

If you or your daughter have questions about your daughter's rights as a research participant or feel that your daughter has not been treated fairly, please call the Homewood Institutional Review Board at Johns Hopkins University at (410) 516-6580.

SIGNATURES

WHAT YOUR SIGNATURE MEANS:
Your electronic signature means that you understand the information in this consent form. Your signature also means that you agree to allow your daughter to participate in the study.

By signing this consent form, you and your daughter have not waived any legal rights your daughter otherwise would have as a participant in a research study.

____
Child's Name

____
Signature of Parent **Date**

____
Signature of Second Parent (if required) **Date**

Title: Addressing Gaps in Eighth-Grade Students' Information Literacy Skills: A Mixed Methods Approach PI: Wendy Drexler, Ph.D. Date: June 6, 2018

____

Signature of Legal Guardian (if applicable) **Date**

Appendix N

Follow-up Email Reminder for Parent Consent Form

Approved August 16, 2018 Protocol Number: HIRB00007608

Dear Parents of the Class of 2023:

Through Veracross, you received a parental consent form that request your child's participation in a research project designed to support students' information literacy skills.

Your child would complete two brief surveys (5-10 minutes each) to measure information literacy skills. Additionally, your child's social studies classes may be observed and your child's work on a reflection paper may be reviewed. If chosen, your child may be asked to participate in a student focus group (30-45 minutes).

All student identifiers will be removed from data. After data analysis, I would be happy to share the results of my research and provide explanations of any findings.

Should you like your child to participate in the research study, please complete the parental consent form available through your Veracross account. Should you decline this opportunity, please also complete the parental consent form.

Many thanks for your response.

Caitlin McLemore, M.Ed.
Academic Technology Specialist, [redacted]
Doctoral Candidate, Johns Hopkins University

Appendix O

Student Recruitment Script

Approved August 16, 2018   Protocol Number: HIRB00007608

Girls,

In addition to my role as Academic Technology Specialist at [redacted], I am currently a doctoral candidate at Johns Hopkins University School of Education. The overall goal of my research is to gain a better understanding of students' information literacy skills in the classroom, specifically how students evaluate online information sources. As part of my program, I would like to invite you all to participate in a research study.

If you agree to participate, you will take two short surveys during social studies class. During some classes in October, you may also see me in your social studies classes observing and taking notes. I may also review your work on a reflection paper that you will complete during that time. Finally, I may ask a few of you to participate in a brief focus group.

Any identifying information will be kept confidential and will not be included in my research report. If you participate in the focus group, no identifying information will be attached to the feedback that you provide.

Know that you do not have to join the research study, it is up to you. You can say OK now and change your mind later, and that will be OK. Your social studies teacher will still want you to participate in the activities and lessons, but if you say no to participating in the research study, then your information will not be included in my research study, and that is totally OK.

Your parents have already provided consent for you to participate in the research study if you choose to do so.

Your teacher has emailed you a link to the first survey. If you are willing to participate in the research study, you can agree on the first page of the survey. If you are not willing to participate, you can also decline to participate.

Are there any questions at this time?

Appendix P

Student Assent Form for Intervention

Approved August 16, 2018 Protocol Number: HIRB00007608

Johns Hopkins University

Homewood Institutional Review Board (HIRB)

Assent Form

Title:	Addressing Gaps in Eighth-Grade Students' Information Literacy Skills: A Mixed Methods Approach
Principal Investigator:	Wendy Drexler, Ph.D. Assistant Professor of Educational Technology Johns Hopkins University School of Education
Student Investigator:	Caitlin McLemore, Doctoral Candidate Johns Hopkins University School of Education
Date:	July 6, 2018

We want to tell you about a research study we are doing. A research study is a way to learn more about something. We would like to find out more about information literacy, or how students evaluate online information sources. You are being asked to join the study because you are an eighth-grade student at [redacted].

If you agree to join this study, you will be asked to:

- Complete two electronic surveys in social studies class (5-10 minutes each).
- You may also be asked to participate in a focus group (up to six students). If chosen, the focus group will take 30-45 minutes and happen during an open free period or study hall.
- The focus group may be audio-recorded for notetaking purposes.

Your classroom may be observed during previously planned lessons in social studies class and notes may be taken on what happens in class. Also, your work on a reflection paper in class may be reviewed as part of the study. The risks of participating in this study are no greater than what you normally experience in daily participation in class.

We expect that this study will help you by teaching you strategies for evaluating online information sources. This study will help us learn more about developing the information literacy skills of eighth-grade students, which may help other children someday.

You do not have to join this study. It is up to you. You can say okay now and change your mind later. All you must do is tell us you want to stop. No one will be mad at you if you don't want to be in the study or if you join the study and change your mind later and stop. Before you say **yes or no** to being in this study, we will answer any questions you have. If you join the study, you can ask questions at any time. Just tell Mrs. McLemore that you have a question. If you want to be in this study, please provide an electronic signature below.

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Assent Form (11/11)
Page 1 of 2

Title: Addressing Gaps in Eighth-Grade Students' Information Literacy Skills: A Mixed Methods Approach PI: Wendy Drexler, Ph.D. Date: June 6, 2018

______________________________ ____________________

Sign your name here **Date**

Appendix Q

Student Recruitment for Intervention Focus Group

Hello [insert student name],

You have been randomly selected to participate in a student focus group. This group will include one student from each of [insert social studies teacher's name]'s sections of eighth-grade social studies.

The focus group will take about 30-45 minutes. I will be recording the focus group so that your participation and responses are accurately recorded in my research. Your personal information will be kept confidential, which means that no identifying information will be included in my research report.

If you are willing to participate, please respond with confirmation to this email. Once everyone in the focus group agrees to participate, Mrs. McLemore will send out information about when and where the focus group will take place.

Thank you,

Mrs. McLemore

Appendix R

Faculty Recruitment Emails for Intervention

Approved August 16, 2018 Protocol Number: HIRB00007608

Faculty Recruitment – Intervention

Hello [insert faculty name],

In addition to my role as Academic Technology Specialist at [redacted], I am currently a doctoral candidate at Johns Hopkins University School of Education. The overall goal of my research is to gain a better understanding of students' information literacy skills in the classroom, with a focus on how students evaluate online information sources. As part of my program, I would like to invite you to participate in a research study.

During the study, students will participate in an online, virtual platform that helps students develop strategies for evaluating online information sources and apply what they learned to research and write an independent reflection paper. The instructional unit will take six, 50-minute class periods and all six sections of eighth-grade social studies will participate. This equals a total of 30 hours of class time. Your role would be to assist social studies teachers during lessons in answering questions and guiding students as needed. I may observe and take notes during lessons.

Please know that all data collected will be kept strictly confidential, meaning that no identifying information will be included in my research report. Your participation in this study is completely voluntary. ***If you have any questions about this email, your potential participation, or anything else related to my research please contact me at*** [redacted] ***or cmclemo3@jhu.edu.***

If you agree to participate, please read and sign the faculty consent form linked here: [insert link to faculty consent form].

Thank you,
Caitlin McLemore

Faculty Recruitment – Intervention

Hello [insert faculty name],

In addition to my role as Academic Technology Specialist at [redacted], I am currently a doctoral candidate at Johns Hopkins University School of Education. The overall goal of my research is to gain a better understanding of students' information literacy skills in the classroom, with a focus on how students evaluate online information sources. As part of my program, I would like to invite you to participate in a research study.

During the study, students will participate in an online, virtual platform that helps students develop strategies for evaluating online information sources and apply what they learned to research and write an independent reflection paper. The instructional unit will take six, 50-minute class periods and all six sections of eighth-grade social studies will participate. Alice Bryant, our middle school librarian, will help you with delivering the lessons. I may observe and take notes during lessons.

Additionally, a few students may be asked to participate in a focus group following the study. These student focus groups will occur during a free period or study hall and will not impact your classroom instructional time. Finally, I would like for students to complete a survey in social studies class, once at the beginning of the school year and once following the instructional unit. Each instance of the student survey will only take about 5-10 minutes to complete.

Please know that all data collected will be kept strictly confidential, meaning that no identifying information will be included in my research report. Your participation in this study is completely voluntary. ***If you have any questions about this email, your potential participation, or anything else related to my research please contact me at*** [redacted] ***or cmclemo3@jhu.edu.***

If you agree to participate, please read and sign the faculty consent form linked here: [insert link to faculty consent form].

Thank you,
Caitlin McLemore

Appendix S

Faculty Consent Form for Intervention

Approved August 16, 2018 Protocol Number: HIRB00007608

Johns Hopkins University
Homewood Institutional Review Board (HIRB)

Informed Consent Form

Title:	Addressing Gaps in Eighth-Grade Students' Information Literacy Skills: A Mixed Methods Approach
Principal Investigator:	Wendy Drexler, Ph.D. Assistant Professor of Educational Technology Johns Hopkins University School of Education
Student Investigator:	Caitlin McLemore, Doctoral Candidate Johns Hopkins University School of Education
Date:	June 6, 2018

PURPOSE OF RESEARCH STUDY:
The purpose of this research study is to examine how student participation in an online, virtual platform might change students' ability to evaluation online information sources. We anticipate that approximately 95 students and three faculty members will participate in this study. This study is being conducted by Caitlin McLemore, who is the Academic Technology Specialist at [redacted].

PROCEDURES:
There will be several parts of this study:

- You may be observed during instruction (six 50-minute classes per class section).
- Your students will be asked to complete an electronic survey before and after instruction, during class time (5-10 minutes).

RISKS/DISCOMFORTS:
The risks associated with participation in this study are no greater than those encountered in daily participation in school activities.

BENEFITS:
We expect that the study will help students by teaching them strategies for evaluating online information sources. This study may benefit education if the results lead to a better understanding of how to provide information literacy skills instruction to eighth-grade students.

VOLUNTARY PARTICIPATION AND RIGHT TO WITHDRAW:
Your participation in this study is entirely voluntary: You choose whether to participate. If you decide not to participate, there are no penalties, and you will not lose any benefits to which you would otherwise be entitled. If you choose to participate in the study, you can stop your

Title: Addressing Gaps in Eighth-Grade Students' Information Literacy Skills: A Mixed Methods Approach PI: Wendy Drexler, Ph.D. Date: June 6, 2018

participation at any time, without any penalty or loss of benefits. If you want to withdraw from the study, please contact Caitlin McLemore at 615-346-0088 or cmclemo3@jhu.edu

CIRCUMSTANCES THAT COULD LEAD US TO END YOUR PARTICIPATION:
We may decide to end your participation before you have completed the study if you at any point during the study no longer teach eighth-grade social studies at Harpeth Hall.

CONFIDENTIALITY:
Any study records that identify you will be kept confidential to the extent possible by law. The records from your participation may be reviewed by people responsible for making sure that research is done properly, including members of the Johns Hopkins University Homewood Institutional Review Board and officials from government agencies such as the National Institutes of Health and the Office for Human Research Protections. (These people are required to keep your identity confidential.) Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

Study records will be created and stored on a password-protected laptop and/or password-protected account. The researchers will use code numbers rather than names on all data sheets.

All data will be destroyed five years after the conclusion of the study.

COMPENSATION:
You will not receive any payment or other compensation for participating in this study.

IF YOU HAVE QUESTIONS OR CONCERNS:
You can ask questions about this research study now or at any time during the study, by talking to Caitlin McLemore at [redacted] or cmclemo3@jhu.edu, or Wendy Drexler at wdrexle1@jhu.edu.

If you have questions about your rights as a research participant or feel that you have not been treated fairly, please call the Homewood Institutional Review Board at Johns Hopkins University at (410) 516-6580.

Title: Addressing Gaps in Eighth-Grade Students' Information Literacy Skills: A Mixed Methods Approach PI: Wendy Drexler, Ph.D. Date: June 6, 2018

SIGNATURE

WHAT YOUR SIGNATURE MEANS:
Your electronic signature below means that you understand the information in this consent form. Your signature also means that you agree to participate in the study. By signing this consent form, you have not waived any legal rights you otherwise would have as a participant in a research study.

____

Participant's Signature **Date**

Bibliography

Abramovich, S., Schunn, C., & Higashi, R. M. (2013). Are badges useful in education?: It depends upon the type of badge and expertise of learner. *Educational Technology Research and Development, 61,* 217-232. doi:10.1007/s11423-013-9289-2

Anderson, K. & May, F. A. (2010). Does the method of instruction matter? An experimental examination of information literacy instruction in the online, blended, and face-to-face classrooms. *The Journal of Academic Librarianship*, *36*, 495-500. doi:10.1016/j.acalib.2010.08.005

Aspen Task Force on Learning and the Internet. (2014). *Learner at the center of a networked world* (Report No. 14/008). Washington, DC: The Aspen Institute. Retrieved from https://assets.aspeninstitute.org/content/uploads/files/content/docs/pubs/Learner-at-the-Center-of-a-Networked-World.pdf

Attali, Y. & Arieli-Attali, M. (2015). Gamification in assessment: Do points affect test performance? *Computers & Education, 83,* 57-63. doi:10.1016/j.compedu.2014.12.012

Au, W. (2007). High-stakes testing and curricular control: A qualitative metasynthesis. *Educational Researcher, 36*, 258-267. doi:10.3102/0013189x07306523

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*, 191-215. doi:10.1037/0033-295X.84.2.191

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory.* Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY: W. H. Freeman.

Becker, B. W. (2013) Gamification of library instruction, *Behavioral & Social Sciences Librarian, 32*, 199-202, doi:10.1080/01639269.2013.821372

Big6. (n.d.). Big6 Skills Overview. Retrieved from http://big6.com/pages/about/big6-skills-overview.php

Bordac, S. (2014). Introduction to media literacy history. *Journal of Media Literacy Education, 6*(2), 1-2. Retrieved from http://digitalcommons.uri.edu/jmle

Bowler, L. (2010). A taxonomy of adolescent metacognitive knowledge during the information search process. *Library & Information Science Research, 32,* 27-42. doi:10.1016/j.lisr.2009.09.005

Branch, J. L. (2003). Instructional intervention is the key: Supporting adolescent information seeking. *School Libraries Worldwide, 9*(2), 47-61. Retrieved from https://www.iasl-online.org/publications/slw/index.html

Bransford, J. D., Brown, A. L., & Cocking, R. R. (2000). *How people learn: Brain, mind, experience, and school.* Washington, DC: National Academy Press.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press.

Bronfenbrenner, U. (1994). Ecology models of human development. In Postlewaite, T.N., & Husen, T. (Eds.), *International encyclopedia of education* (pp. 1643-1647). Oxford, England: Elsevier.

Broussard, M. J. S. & Oberlin, J. U. (2011). Using online games to fight plagiarism: A spoonful of sugar helps the medicine go down. *Indiana Libraries, 30*(1), 28-39. doi:10.4337/9781782549727.00006

Bruning, R. H., Schraw, G. J., & Norby, M. M. (2011). *Cognitive psychology and instruction.* New York, NY: Pearson.

Bryk, A. S., Gomez, L. M., Grunow, A., & LeMahieu, P. G. (2015). *Learning to improve: How America's schools can get better at getting better*. Cambridge, MA: Harvard Education Press.

Center for Media Literacy. (2003). *Teacher's/leader's orientation guide: Literacy for the 21st century.* Santa Monica, CA. Retrieved from http://www.medialit.org/sites/default/files/mlk_orientationguide.pdf

Chakrabarti, R. (2008). Can increasing private school participation and monetary loss in a voucher program affect public school performance? Evidence from Milwaukee. *Journal of Public Economics, 92*, 1371-1393. doi:10.1016/j.jpubeco.2007.06.009

Chung, J. S. & Neuman, D. (2007). High school students' information seeking and use for class projects. *Journal of the Association for Information Science and Technology, 58*, 1503-1517. doi:10.1002/asi.20637

Collins, A. & Halverson, R. (2010). The second educational revolution: Rethinking education in the age of technology. *Journal of Computer Assisted Learning, 26*, 18-27. doi:10.1111/j.1365-2729.2009.00339.x

Considine, D., Horton, J., & Moorman, G. (2009). Teaching and reaching the millennial generation through media literacy. *Journal of Adolescent & Adult Literacy, 52,* 471-481. doi:10.1598/jaal.52.6.2

Creswell, J. W. & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage.

Daunic, R. (2011). 10 Years of Media Literacy Education in K-12 Schools. *Journal of Media Literacy Education, 3*(1), 209-210. Retrieved from http://digitalcommons.uri.edu/jmle

Deal, D., Flores-Koulish, S., & Sears, J. (2013). Media literacy teacher talk: Interpretation, value, and implementation. *Journal of Media Literacy Education*, *1*(2), 121-131. Retrieved from http://digitalcommons.uri.edu/jmle

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining gamification. *Proceedings of the MindTrek Conference, Finland, 15,* 9-15. doi:10.1145/2181037.2181040

Dicheva, D., Dichev, C., Agre, G., & Angelova, G. (2015). Gamification in education: a systematic mapping study. *Journal of Educational Technology & Society, 18,* 75-88. Retrieved from https://www.j-ets.net/ETS/index.html

Dotson, D. S. & Diaz, K. R. (2008). Discipline-specific library instruction for millennial students. *MERLOT Journal of Online Learning and Teaching, 4*, 560-573. Retrieved from http://jolt.merlot.org

Drexler, W. (2010). The networked student model for construction of personal learning environments: Balancing teacher control and student autonomy. *Australasian Journal of Educational Technology, 26*, 369-385. doi:10.14742/ajet.1081

Dusenbury, L., Brannigan, R., Falco, M., & Hansen, W. B. (2003). A review of research on fidelity of implementation: Implications for drug abuse prevention in school settings. *Health Education Research, 18,* 237–256. doi:10.1093/her/18.2.237

Eisenhart, M. A. (1991). Conceptual frameworks for research circa 1991: Ideas from a cultural anthropologist; implications for mathematics education researchers. *Proceedings of the North American Chapter of the International Group for the Psychology of Mathematics Education, Blacksburg, VA, 13,* 202-219. Blacksburg, VA. Retrieved from http://nepc.colorado.edu/files/Eisenhart_ConceptualFrameworksforResearch.pdf

Ernest, P. (2010). Reflections on theories of learning. In B. Sriraman & L. English (Eds.), *Theories of mathematics education* (pp. 39-48). New York, NY: Springer.

Ertmer, P. A. & Newby, T. J. (1993). Behaviorism, cognitivism, constructivism: Comparing critical features from an instructional design perspective. *Performance Improvement Quarterly, 6*(4), 50-72. doi:10.1111/j.1937-8327.1993.tb00605.x

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & Education, 59,* 423-435. doi:10.1016/j.compedu.2012.02.001

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34*, 906-911. doi:10.1037/0003-066X.34.10.906

Ford, E., Izumi, B., Lottes, J., & Richardson, D. (2015). Badge it! A collaborative learning outcomes based approach to integrating information literacy badges within disciplinary curriculum. *Reference Services Review, 43,* 31-44. doi:10.1108/rsr-07-2014-0026

Gee, J. P. (2003). *What video games have to teach us about language and literacy.* New York, NY: Palgrave MacMillan.

Geer, R. & Sweeney, T. A. (2012). Students' voices about learning with technology. *Journal of Social Sciences, 8,* 294-303. doi:10.3844/jssp.2012.294.303

Geyer, R. W. (2009). Developing the internet-savviness (IS) scale: Investigating the relationships between internet use and academically talented middle school youth. *RMLE Online, 32*(5), 1-20. doi:10.1080/19404476.2009.11462058

Grafstein, A. (2002). A discipline-based approach to information literacy. *The Journal of Academic Librarianship, 28,* 197-204. doi:10.1016/S0099-1333(02)00283-5

Greer, K., Hess, A. N., & Kraemer, E. W. (2016). The librarian leading the machine: A reassessment of library instruction methods. *College & Research Libraries, 77,* 286-301. doi:10.5860/crl.77.3.286

Groff, J., Howells, C., & Cranmer, S. (2012). Console game-based pedagogy: A study of primary and secondary classroom learning through console video games. *International Journal of Game-Based Learning, 2*(2), 35-54. doi:10.4018/ijgbl.2012040103

Gross, M. & Latham, D. (2007) Attaining information literacy: An investigation of the relationship between skill level, self-estimates of skill, and library anxiety. *Library & Information Science Research, 29,* 332-353. doi:10.1016/j.lisr.2007.04.012

Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? A literature review of empirical studies on gamification. *Proceedings of the Hawaii International Conference on System Science, 47,* 3025-3034. doi:10.1109/hicss.2014.377

Hamari, J., Shernoff, D. J., Rowe, E., Coller. B., & Edwards, T. (2016). Challenging games help students learn: An empirical study on engagement, flow and immersion in game-based learning. *Computers in Human Behavior, 54*, 170-179. doi:10.1016/j.chb.2015.07.045

Hanus, M. D. & Fox, J. (2015). Assessing the effects of gamification in the classroom: A longitudinal study on intrinsic motivation, social comparison, satisfaction, effort, and academic performance. *Computers & Education, 80,* 152-161. doi:10.1016/j.compedu.2014.08.019

Hargittai, E., Fullerton, L., Menchen-Trevino, E., & Thomas, K. Y. (2010). Trust online: Young adults' evaluation of web content. *International Journal of Communication, 4,* 468-494. Retrieved from http://ijoc.org

Harris, G. H. (2010). To infinity and beyond! *Kappa Delta Pi Record, 46*(3), 118-120. doi:10.1080/00228958.2010.10516708

Head, A. J., Van Hoeck, M., Eschler, J., & Fullerton, S. (2013). What information competencies matter in today's workplace? *Library and Information Research*, *37*(114), 74-104. Retrieved from http://www.lirgjournal.org.uk/lir

Henry, G. (2010). Comparison group designs. In J. Wholey, H. Hatry, & K. Newcomer (Eds.), *Handbook of practical program evaluation* (pp. 125-143). San Francisco, CA: Jossey-Bass.

Hobbs, R. (2010). *Digital and media literacy: A plan of action* (Report No. 10/020). Washington, DC: The Aspen Institute Communications and Society Program. Retrieved from https://assets.aspeninstitute.org/content/uploads/2010/11/Digital_and_Media_Literacy.pdf

Hobbs, R. (2011). The state of media literacy: A response to Potter. *Journal of Broadcasting & Electronic Media, 55,* 419-430. doi:10.1080/08838151.2011.597594

International Society for Technology in Education (2016). *Student Standards.* Retrieved from https://www.iste.org/standards/standards/for-students

Jackson, P. A. (2007). Integrating information literacy into Blackboard: Building campus partnerships for successful student learning. *The Journal of Academic Librarianship, 33*, 454-461. doi:10.1016/j.acalib.2007.03.010

Jenkins, H., Clinton, K., Purushotma, R., Robison, A. J., & Weigel, M. (2006). *Confronting the challenges of participatory culture: Media education for the 21st century.* Chicago, IL: The MacArthur Foundation. Retrieved from https://www.macfound.org/media/article_pdfs/JENKINS_WHITE_PAPER.PDF

Jolls, T. & Wilson, C. (2014). The core concepts: Fundamental to media literacy yesterday, today and tomorrow. *Journal of Media Literacy Education, 6*(2), 68-78. Retrieved from http://digitalcommons.uri.edu/jmle

Julien, H. & Barker, S. (2009). How high-school students find and evaluate scientific information: A basis for information literacy skills development. *Library & Information Science Research, 31,* 12-17. doi:10.1016/j.lisr.2008.10.008

Kellner, D. & Share, J. (2005). Toward critical media literacy: Core concepts, debates, organizations, and policy. *Discourse: Studies in the Cultural Politics of Education, 26,* 369-386. doi:10.1080/01596300500200169

Kellner, D. & Share, J. (2007). Critical media literacy is not an option. *Learning Inquiry*, *1*, 59-69. doi:10.1007/s11519-007-0004-2

Kent State University Libraries. (2017). *TRAILS: Tool for Real-time Assessment of Information Literacy Skills.* Retrieved from http://www.trails-9.org/

Ketelhut, D. J. (2007). The impact of student self-efficacy on scientific inquiry skills: An exploratory investigation in River City, a multi-user virtual environment. *Journal of Science Education and Technology, 16,* 99-111. doi:10.1007/s10956-006-9038-y

Kim, C., Kim, M. K., Lee, C., Spector, J. M., & DeMeester, K. (2013). Teacher beliefs and technology integration. *Teaching and Teacher Education, 29*(1), 76-85. doi:10.1016/j.tate.2012.08.005

Koltay, T. (2011). The media and the literacies: media literacy, information literacy, digital literacy. *Media Culture Society, 33,* 211-221. doi:10.1177/0163443710393382

Kuhlthau, C. C. (1990). The information search process: From theory to practice. *Journal of Education for Library and Information Science*, *31*(1), 72-75. doi:10.2307/40323730

Kuhlthau, C. C., Heinström, J., & Todd, R. J. (2008). The 'information search process' revisited: Is the model still useful. *Information Research*, *13*(4), 13-28. Retrieved from http://www.informationr.net/ir/

Kurbanoglu, S., Akkoyunlu, B., & Umay, A. (2006). Developing the information literacy self-efficacy scale. *Journal of Documentation, 62*, 730-743. doi:10.1108/00220410610714949

Kwon, N. (2008). A mixed-methods investigation of the relationship between critical thinking and library anxiety among undergraduate students in their information search process. *College & Research Libraries*, *69*, 117-131. doi:10.5860/crl.69.2.117

Laubersheimer, J., Ryan, D., & Champaign, J. (2016). InfoSkills2Go: Using badges and gamification to teach information literacy skills and concepts to college-bound high school students. J*ournal of Library Administration, 56*, 924-938. doi:10.1080/01930826.2015.1123588

Lester, F. K. (2005). On the theoretical, conceptual, and philosophical foundations for research in mathematics education. *ZDM*, *37*(6), 457-467. doi:10.1007/bf02655854

Limberg, L., Alexandersson, M., Lantz-Andersson, A., & Folkesson, L. (2008). What matters? Shaping meaningful learning through teaching information literacy. *Libri, 58,* 82-91. doi:10.1515/libr.2008.010

Linnan, L. & Steckler, A. (2002). *Process evaluations for public health interventions and research.* San Francisco, CA, John Wiley and Sons.

Literat, I. (2014). Measuring new media literacies: Towards the development of a comprehensive assessment tool. *Journal of Media Literacy Education*, *6*(1), 15-27. Retrieved from http://digitalcommons.uri.edu/jmle

Liu, M., Hsieh, P., Cho, Y., & Schallert, D. (2006). Middle school students' self-efficacy, attitudes, and achievement in a computer-enhanced problem-based learning environment. *Journal of Interactive Learning Research, 17,* 225-242. Retrieved from http://www.learntechlib.org

Livingstone, S. (2012). Critical reflections on the benefits of ICT in education. *Oxford Review of Education, 38,* 9-24. doi:10.1080/03054985.2011.577938

Loertscher, D. (2008). Information literacy: 20 years later. *Teacher Librarian, 35*(5), 42-43. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=32753574&site=ehost-live&scope=site

Madaus, G. & Russell, M. (2010). Paradoxes of high-stakes testing. *The Journal of Education, 190*(1/2), 21-30. Retrieved from http://www.bu.edu/journalofeducation

Mahoney, K. R. & Khwaja, T. (2016). Living and leading in a digital age: A narrative study of the attitudes and perceptions of school leaders about media literacy. *Journal of Media Literacy Education, 8*(2), 77-98. Retrieved from http://digitalcommons.uri.edu/jmle

Markey, K., Leeder, C. & St. Jean, B. (2011). Students' behaviour playing an online information literacy game. *Journal of Information Literacy, 5*(2), 46-65. doi:10.11645/5.2.1637

Markey, K., Leeder, C., & Young Rieh, S. (2012). Through a game darkly: Student experiences with the technology of the library research process. *Library Hi Tech, 30,* 12-34. doi:10.1108/07378831211213193

Marlow, M. L. (2010). The influence of private school enrollment on public school performance. *Applied Economics, 42,* 11-22. doi:10.1080/00036840701564418

McCabe, J. & Wise, S. (2009). It's all fun and games until someone learns something: Assessing the learning outcomes of two educational games. *Evidence Based Library and Information Practice, 4*(4), 6-23. doi:10.18438/b8fc8m

McClure, R., Cooke, R., & Carlin, A. (2011). The search for the Skunk Ape: studying the impact of an online information literacy tutorial on student writing. *Journal of Information Literacy*, *5*(2), 26-45. doi:10.11645/5.2.1638

McGonigal, J. (2011). *Reality is broken: Why games make us better and how they can change the world.* New York, NY: Penguin.

Mehta, J. (2013). How paradigms create politics: The transformation of American educational policy, 1980-2001. *American Educational Research Journal, 50*, 285–324. doi:10.3102/0002831212471417

Metzger, M. J. (2007). Making sense of credibility on the Web: Models for evaluating online information and recommendations for future research. *Journal of the Association for Information Science and Technology, 58,* 2078-2091. doi:10.1002/asi.20672

Metzger, M. J., Flanagin, A. J., Markov, A., Grossman, R., & Bulger, M. (2015). Believing the unbelievable: understanding young people's information literacy beliefs and practices in the United States. *Journal of Children and Media, 9,* 325-348. doi:10.1080/17482798.2015.1056817

Misra, K., Grimes, P. W., & Rogers, K. E. (2012). Does competition improve public school efficiency? A spatial analysis. *Economics of Education Review, 31*(6), 1177-1190. doi:10.1016/j.econedurev.2012.08.001

Mohktar, I. A., Majid, S., & Foo, S. (2008). Teaching information literacy through learning styles: The application of Gardner's multiple intelligences. *Journal of Librarianship and Information Science, 40,* 93-109. doi:10.1177/0961000608089345

Neal, J. W. & Neal, Z. P. (2013). Nested or networked? Future directions for ecological systems theory. *Social Development, 22,* 722-737. doi:10.1111/sode.12018

News Literacy Project. (2019a). Arguments and evidence. Retrieved from https://checkology.org/lessons/lesson/43

News Literacy Project. (2019b). Misinformation. Retrieved from https://checkology.org/lessons/lesson/58

News Literacy Project. (2019c). Practicing quality journalism. Retrieved from https://checkology.org/lessons/lesson/8

News Literacy Project. (2019d). Understanding bias. Retrieved from https://checkology.org/lessons/lesson/9

O'Leary, Z. (2014). *The essential guide to doing your research project.* London, UK: Sage.

Partnership for 21st Century Learning. (2015). *P21 framework definitions.* Washington, DC. Retrieved from http://www.p21.org/storage/documents/docs/P21_Framework_Definitions_New_Logo_2015.pdf

Pinto, M., Cordon, J. A., & Diaz, R. G. (2010). Thirty years of information literacy (1977-2007): A terminological, conceptual and statistical analysis. *Journal of Librarianship and Information Science, 42,* 3-19. doi:10.1177/0961000609345091

Pittman, T. & Gaines, T. (2015). Technology integration in third, fourth and fifth grade classrooms in a Florida school district. *Educational Technology Research and Development, 63*, 539-554. doi:10.1007/s11423-015-9391-8

Polizzi, G. (2011). Measuring school principals' support for ICT integration in Palermo, Italy. *Journal of Media Literacy Education, 3*(2), 113-122. Retrieved from http://digitalcommons.uri.edu/jmle

Potter, W. J. (2004). Argument for the need for a cognitive theory of media literacy. *American Behavioral Scientist, 48,* 266-272. doi:10.1177/0002764204267274

Probert, E. (2009). Information literacy skills: Teacher understandings and practice. *Computers & Education, 53,* 24-33. doi:10.1016/j.compedu.2008.12.018

Pun, R. (2017). Hacking the research library: Wikipedia, Trump, and information literacy in the escape room at Fresno State. *The Library Quarterly, 87,* 330-336. doi:10.1086/693489

Rantala, L. (2009). In search of third spaces in media education: An ethnographic study from fifth graders' media workshop. *Pedagogy, Culture & Society*, *17*, 385-399. doi:10.1080/14681360903194392

Reedy, K., Mallett, E., & Soma, N. (2013). iKnow: Information skills in the 21st century workplace. *Library and Information Research*, *37*(114), 105-122. Retrieved from http://www.lirgjournal.org.uk/lir

Rosenzweig, A. (2017). Understanding and undermining fake news from the classroom. *Berkeley Review of Education, 7*(1), 105-112. Retrieved from http://www.berkeleyreviewofeducation.com/journal-issues.html

Ross, M., Perkins, H., & Bodey, K. (2016). Academic motivation and information literacy self-efficacy: The importance of a simple desire to know. *Library & Information Science Research, 38,* 2-9. doi:10.1016/j.lisr.2016.01.002

Rowlands, I., Nicholas, D., Williams, P., Huntington, P., Fieldhouse, M., Gunter, B., ... & Tenopir, C. (2008). The Google generation: The information behaviour of the researcher of the future. *Aslib Proceedings, 60,* 290-310. doi:10.1108/00012530810887953

Saldaña, J. (2016). *The coding manual for qualitative researchers.* London, UK: Sage.

Saunders, R. P., Evans, M. H., Joshi, P. (2005). Developing a process-evaluation plan for assessing a health promotion program implementation: A how-to guide. *Evaluation and Practice, 6,* 134-147. doi:10.1177/1524839904273387

Schilder, E. A., Lockee, B. B., & Saxon, D. P. (2016) The challenges of assessing media literacy education. *Journal of Media Literacy Education, 8*(1), 32-48. Retrieved from http://digitalcommons.uri.edu/jmle

Schrum, L., Galizio, L. M., & Ledesma, P. (2011). Educational leadership and technology integration: An investigation into preparation, experiences, and roles. *Journal of School Leadership, 21*, 241-261. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=eue&AN=66567483&site=ehost-live&scope=site

Schunk, D. H. (2012). *Learning theories: An educational perspective*. Boston, MA: Pearson.

Schutt, R. K. (2015). *Investigating the social world: The process and practice of research*. Thousand Oaks, CA: Sage.

Shadish, W., Cook, T., & Campbell, D. (2002). *Experimental and quasi-experimental designs for generalized causal inference.* Boston, MA: Houghton Mifflin.

Shaffer, D. W., Squire, K. R., Halverson, R., & Gee, J. P. (2005). Video games and the future of learning. *Phi Delta Kappan, 87*, 104-111. doi:10.1177/003172170508700205

Shifflet, R. & Weilbacher, G. (2015). Teacher beliefs and their influence on technology use: A case study. *Contemporary Issues in Technology and Teacher Education, 15,* 368-394. Retrieved from http://www.citejournal.org

Smale, M. A. (2011). Learning through quests and contests: Games in information literacy instruction. *Journal of Library Innovation, 2*(2), 36-55. Retrieved from http://www.libraryinnovation.org

Stanford History Education Group (2016). *Evaluating information: The cornerstone of civic online reasoning*. (Executive Summary). Retrieved from http://sheg.stanford.edu/upload/V3LessonPlans/Executive%20Summary%2011.21.16.pdf

Stefl-Mabry, J., Radlick, M., & Doane, W. (2010). Can you hear me now? Student voice: High school & middle school students' perceptions of teachers, ICT and learning. *International Journal of Education and Development, 6*(4), 64-82. Retrieved from http://ijedict.dec.uwi.edu

Sun-Lin, H. Z. & Chiou, G. F. (2017). Effects of self-explanation and game-reward on sixth graders' algebra variable learning. *Journal of Educational Technology & Society, 20,* 126-137. doi:10.12973/eurasia.2017.01244a

Tezci, E. (2011). Turkish primary school teachers' perceptions of school culture regarding ICT integration. *Educational Technology Research and Development*, *59*, 429-443. doi:10.1007/s11423-011-9205-6

Trilling, B. & Fadel, C. (2009). *21st century skills: Learning for life in our times*. San Francisco, CA: John Wiley & Sons.

Trustees of Phillips Exeter Academy (2019). *Harkness.* Retrieved from https://www.exeter.edu/exeter-difference/how-youll-learn

Tu, Y. W., Shih, M., & Tsai, C. C. (2008). Eighth graders' web searching strategies and outcomes: The role of task types, web experiences and epistemological beliefs. *Computers & Education, 51,* 1142-1153. doi:10.1016/j.compedu.2007.11.003

Tyack, D. B. & Cuban, L. (1995). *Tinkering toward utopia: A century of public school reform.* Cambridge, MA: Harvard University Press.

U.S. Department of Education, Office of Educational Technology. (2017). *Reimagining the role of technology in education: 2017 National Educational Technology Plan update.* Retrieved from https://tech.ed.gov/netp

van Meegen, A. & Limpens, I. (2010). How serious do we need to be? Improving information literacy skills through gaming and interactive elements. *Liber Quarterly, 20*, 270-288. doi:10.18352/lq.7993

von Glasersfeld, E. (2005). Introduction: Aspects of constructivism. In C. T. Fosnot (Ed.), *Constructivism: Theory, perspectives, and practice* (pp. 3-7). New York, NY: Teachers College Press.

Voogt, J., Erstad, O., Dede, C., & Mishra, P. (2013). Challenges to learning and schooling in the digital networked world of the 21st century. *Journal of Computer Assisted Learning, 29,* 403-413. doi:10.1111/jcal.12029

Walraven, A., Brand-Gruwel, S., & Boshuizen, H. P. (2009). How students evaluate information and sources when searching the World Wide Web for information. *Computers & Education, 52,* 234-246. doi:10.1016/j.compedu.2008.08.003

Walsh, A. (2014) The potential for using gamification in academic libraries in order to increase student engagement and achievement. *Nordic Journal of Information Literacy in Higher Education, 6*, 39-51. Retrieved from https://noril.uib.no

Yates, B. L. (1997). Proceedings from National Media Literacy Citizenship Project's Summer Conference: *Media Education's Present and Future: A Survey of Teachers.* Birmingham, AL: NML. Retrieved from http://files.eric.ed.gov/fulltext/ED424601.pdf

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